Police Vehicle Stops in Cincinnati:
July 1 – December 31, 2001

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On March 28, 2001, the Cincinnati City Council passed an ordinance requiring the police to collect information on the race of people in vehicles stopped by police officers and required that the data from these records be analyzed by experts outside of the police department. This ordinance was the culmination of over a year's worth of public discussion regarding allegations that members of the police department unfairly targeted African-Americans - an alleged practice that many have called "racial profiling."

The police department began collecting the required data on May 7, 2001 and established a competitive bidding process for the data analysis. The city issued a request for proposals to analyze the data on May 29th. The contract to analyze the police vehicle stops data was awarded to a team from the University of Cincinnati (the authors of this report) on October 8, 2001. By January 27, 2003, all data covering stops from July 1, 2001 through December 31, 2001 had been entered into computer files and turned over to us. This time window was selected because we were concerned that data collected before July 1, 2001 would be unrepresentative of police stops, as officers had not become used to the new form and because of the events April through June of that year.

This document is the report describing our analysis, findings, and conclusions regarding the level and causes of disproportionality in police vehicle stops. It is important to note here that a finding that African-Americans are disproportionality stopped by the police does not, in and of itself, imply any particular cause. There are many possible causes. Among the possible explanations are:

- Racial bias against African-Americans by White police;
- Bias may stem from a shared perception among most police, of any race, that African-Americans are more likely than Whites to be involved in deviant activities (deviant activities involves a wide range of misconducts including minor transgressions of ordinances, traffic offenses, disorderly behavior, and criminal conduct);
- Disproportionate involvement in deviant activity among African-Americans brings them to police attention with greater frequency than is the case among Whites. That is, the police simply react to a preexisting set of circumstances; and
- A strategic posture of the police department that encourages the use of vehicle stops based on the hypothesis that such stops discourage deviant behavior but has the effect of increasing disproportionality. That is, without intending to, a proactive, aggressive enforcement policy contributes to any preexisting disproportionality.

The type of data analyzed in this report cannot provide a definitive answer to two important questions:

1. To what degree are African-Americans subjected to police stops out of proportion to their involvement in deviant behavior?
2. And, if there is disproportionality, what are its causes.

The first question cannot be answered definitively because we have no precise measures of deviance by race. Deviance, including crime, disorder, and traffic infractions, is usually hidden from police, for obvious reasons. Nevertheless, police are the primary source of data on deviance. And to the degree that the police are mistrusted, data produced by the police are likely to be mistrusted.

It is difficult to answer the second question for reasons similar to those for the first question. But there is another problem. The decision to collect data on the race of individuals stopped by the police implies that the cause of any disproportionality rests with the officers making the stops. Not all hypotheses about the causes of disproportionality place the responsibility on the shoulders of the officers, and to adequately explore them, other data is required. In particular, the hypothesis that disproportionality arises, at least in part, from the strategic posture of the police agency as a whole (even if all officers are bias- free), is particularly difficult to evaluate with officer stop data. Similarly, the hypothesis that disproportionality in stops stems directly from disproportionate involvement in deviance is also difficult to evaluate with police stop data. Consequently, the decision to collect police stop data directs attention toward one hypothesis and away from others. To the extent possible, we have tried to address this problem when we offer interpretations of the analysis results in our conclusions.

Nevertheless, we can learn a great deal by examining the patterns of stops with regard to race. This can help define the problem more precisely and provide a basis for fruitful discussion leading to meaningful policy. We attempt to answer these two questions within the inherent limits of this data, and we try to assess each of these hypotheses.

This is a controversial topic and the City Council wisely sought outside assistance to examine this data. It is important therefore to disclose the nature of police involvement in the production of this report. Throughout our work on this study, we met with members of the police department. The first meetings were to learn how the data was being recorded, and later meetings were held to assist the police department in developing a database that could be analyzed. Once the data had been entered into the database, the project team met monthly with members of the police department to describe our progress in correcting errors created when data from paper records were entered into the database. The research team also used these meetings to obtain additional information needed to analyze the vehicle stops data and to report on interim findings. At no time during any of these meetings did any member of the police department or city employee try to influence the way we conducted our analysis or how we interpreted the findings. In fact, members of the police department were repeatedly and explicitly explained that they did not want to have any role in guiding the analysis or interpreting the findings.

In the spring of 2003 and in early September 2003, the project team briefed representatives of the collaborative parties. And on two occasions, the team

briefed the City Manager, Valerie Lemmie. On one occasion, Councilman DeWine sat in on a briefing. Like members of the police department, these individuals made no effort to influence how we conducted our work. The result is that this report contains only our views, based on our interpretation of how the analysis of these data should be conducted and the meaning of the analysis results.

This report is divided into six sections. The first section describes the sources of data and the analytical approach taken by the research team. The second section describes the characteristics of the people stopped by the Cincinnati Police from July 1 through December 31, 2001 in Cincinnati. The third section examines reasons for the stops, as recorded by police officers. In the fourth section, we look at the level and geographic distribution of racial disproportionality in police vehicle stops. The fifth section examines the results of stops, or the sanctions given to citizens stopped by the police. The last section summarizes our findings and describes our conclusions regarding the level of disproportionality and its causes.

I. WHAT WAS ANALYZED?

The data we analyzed for this report came from contact cards completed by police officers after they stopped vehicles. The terms of the city ordinance and the contract with the University of Cincinnati specify vehicle stops. Officers also filled out these cards when making pedestrian stops. We did not analyze pedestrian stops because of the terms of the contract. Police data entry personnel manually entered completed cards into computer files. The police department then provided us with the computer files and copies of the original cards. The data was divided into three linked databases. One described the stops. Another described the occupants. And the third described the outcomes.

All but 75 computer cases were checked against paper records for accuracy (about one percent). The team accepted what officers wrote on the forms, unless there was objective information available to indicate an error. Most information could not be independently verified. Errors on original records do not appear to be systematic but rather the normal result of everyday work.

We were able to identify discrepancies between the officers' cards and the computer records. There are two ways to assess the error rate. The first is the number of card entries with errors. As each card has multiple fields (check boxes and open boxes for entering information), we also examined the error rate for fields. Error rates varied by database as follows:

ERROR RATE (%) FOR DATA ENTRY		
Database	Card Entries	Fields
Stops	38	3
Occupants	27	6
Outcomes	51	2

We checked almost all data fields and made corrections. The exceptions include descriptions of citizens stopped (e.g., height, weight,

and hair color). When duplicate records were found in the computer records, we eliminated this redundancy. Record checking and error correction proceeded from July 2002 through May 7, 2003.

We reported to the Cincinnati Police the data entry problems throughout the process and the police made efforts to improve their systems accordingly. As noted above, the analysis examined stop data from July 1, 2001 through December 31, 2001. During this period, about 7,900 stops were made. Approximately 7,200 of these were vehicle stops. According to the contact cards, these stops involved around 10,800 people. Though officers usually completed all relevant fields on the cards, sometimes data was missing. In the analysis that follows, the base numbers vary as the number of fully completed records varies. For example, when we examine the effect of number of occupants in a vehicle on the duration of stops for African-Americans and Whites, we only looked at stops where information was available describing the number of occupants, the length of the stop, and the race of the driver. Details of the analysis, and additional data used, are provided in the following narrative describing the analysis results.

II. WHO IS STOPPED?

Officers completing the field contact card enter information on the race, gender, and age of the driver and occupants. We focus on the descriptions of the driver for three reasons. First, all vehicles have a driver. Second, as we show later, the major reason for stopping vehicles has to do with actions of the driver (i.e., moving violations). Third, mixed race vehicles are rarely stopped.

Table 1: RACE OF DRIVERS STOPPED

	Percent	Number
White	49.0	3491
Black	48.6	3460
Hispanic	0.7	48
Asian	0.6	44
Native American	0.0	3
Other	1.1	75
Total	100.0	7121

157 cases had no race information. This is about 2% of the 7278 vehicle stop cards

As can be seen in Table 1, stops are almost equally split between African-Americans and White. Because of the relatively few number of non-White and non-African-American drivers, in the analysis that follows, we combine them into the category "other", which comprises 2.4 percent of the total. We report on the analysis for drivers of these other races, but we do not discuss these results as the small numbers and heterogeneous population make it difficult to draw any conclusions about police interactions with them.

Table 2: RACE AND GENDER OF DRIVERS

	White	Black	Other	All
Male	68.1	73.3	81.2	70.9
	(2376)	(2535)	(138)	(5049)
Female	31.9	26.7	18.2	29.1
	(1115)	(923)	(31)	(2069)
Unknown	0.0	0.1	0.6	0.0*
	(0)	(2)	(1)	(3)
Total	100.0	100.0	100.0	100.0
	(3491)	(3460)	(170)	(7121)

*less than five one hundredths of a percent

Overall, the differences between the African-American drivers stopped and the White drivers stopped are slight. Drivers are predominately male, regardless of race (Table 2). With regard to age (Table 3), African-American drivers are slightly younger.

Table 3: RACE AND AGE OF DRIVERS

	White	Black	Other	All
Under 18	2.5	3.0	2.9	2.8
	(87)	(104)	(5)	(196)
18-25	33.1	39.3	38.2	36.2
	(1156)	(1359)	(65)	(2580)
26-35	26.5	26.4	32.4	26.6
	(924)	(912)	(55)	(1891)
36-45	19.9	18.8	15.3	19.3
	(696)	(652)	(26)	(1374)
Over 45	17.8	12.3	9.4	14.9
	(620)	(427)	(16)	(1063)
Unknown	0.2	0.2	1.8	0.2
	(8)	(6)	(3)	(17)
Total	100.0	100.0	100.0	100.0
	(3491)	(3460)	(170)	(7121)

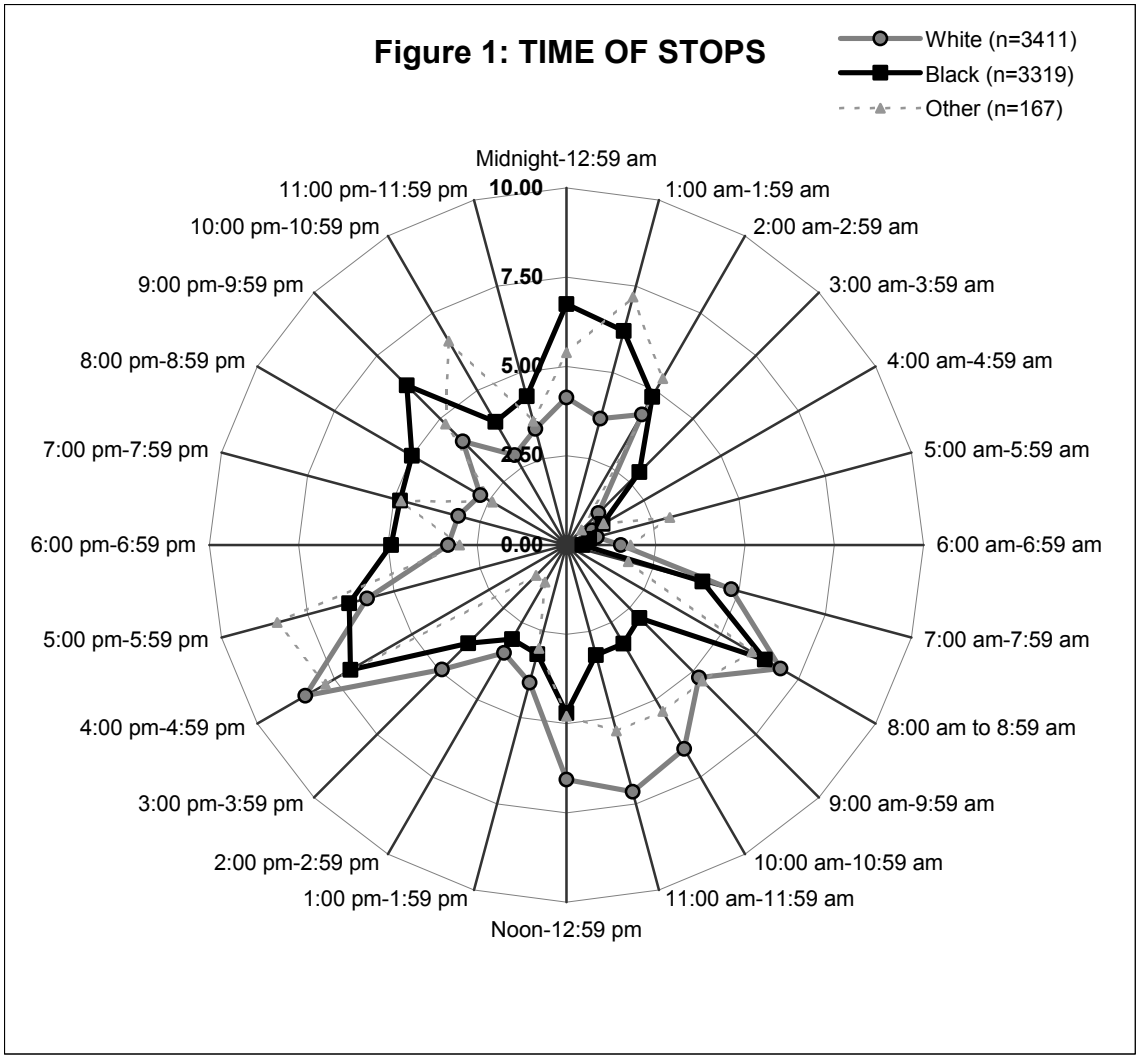
One well established fact is that most crime and disorder is committed by a relatively few repeat offenders. How often do police stop the same individual and are there racial differences in repeat stopping? The answers are shown in Table 4. The first thing to note is that repeat stopping of the same individuals is rare, regardless of race. The second thing to notice is that repeat stopping is four times higher for African Americans than Whites. This suggests that the count of stops for African Americans is slightly elevated, relative to Whites, because of the interaction of a few drivers with the police. That is, if all drivers had only one contact with the police, there would be fewer stops for African-Americans and for Whites, but the drop would be greater for African-Americans.

(These estimates of the number of repeat drivers are an underestimate because of what is known as the “window effect.” We are examining a set 6-month time window. Drivers who had been stopped in the months prior to this time window, and are stopped once during these 6-months, are recorded as single stop drivers. Similarly, drivers stopped once during this period, and again shortly after the period ended, also get recorded as single stop drivers. But in both cases, these individuals are repeatedly stopped. With a longer data series, more precise estimates of the number of drivers repeatedly stopped could be obtained.)

Table 4: REPEAT STOPS OF THE SAME DRIVERS
(n=drivers)

# of Stops	White	Black	Other	All
1	98.52	93.52	94.00	91.8
	(3335)	(2988)	(282)	(6605)
2	1.42	5.67	5.33	6.8
	(48)	(181)	(16)	(245)
3	0.06	0.63	0.00	0.9
	(2)	(20)	(0)	(22)
4	0.00	0.16	0.67	0.4
	(0)	(5)	(2)	(7)
5	0.00	0.03	0.00	0.1
	(0)	(1)	(0)	(1)
Total	100.0	100.0	100.0	100.0
	(3385)	(3195)	(300)	(6880)
stops>1	1.48	6.48	6.00	8.2
	(50)	(207)	(18)	(275)

Police stops of vehicles show distinct temporal patterns reflecting the daily flow of traffic to and from work and evening entertainment. Figure 1 shows this rhythm for African American and White drivers. Each radial line represents an hour block starting with midnight at the top, moving clockwise to noon at the bottom, and then back to midnight. The concentric rings are set at 2.5 percent intervals. The outer ring is at 10 percent. The lines trace the percent of drivers of each race stopped in each one-hour interval. Though the stops of African-Americans and Whites follow the same daily rhythms, there are some differences. Namely, stopping of White drivers is more common from 6 am to 5pm and stopping of African-Americans is more common from 5pm to 4am.



There are similarities and differences in the number of occupants in stopped vehicles. Figure 2 shows that single occupant vehicles predominate for both races, but African-American vehicles are more likely to have two or more passengers. Figures 3 and 4 show the occupant numbers by day (6am to 7pm) and night (7pm to 6am). During the day, the differences between Whites and African-Americans are slight. Most of the differences in occupants are in the night stops.

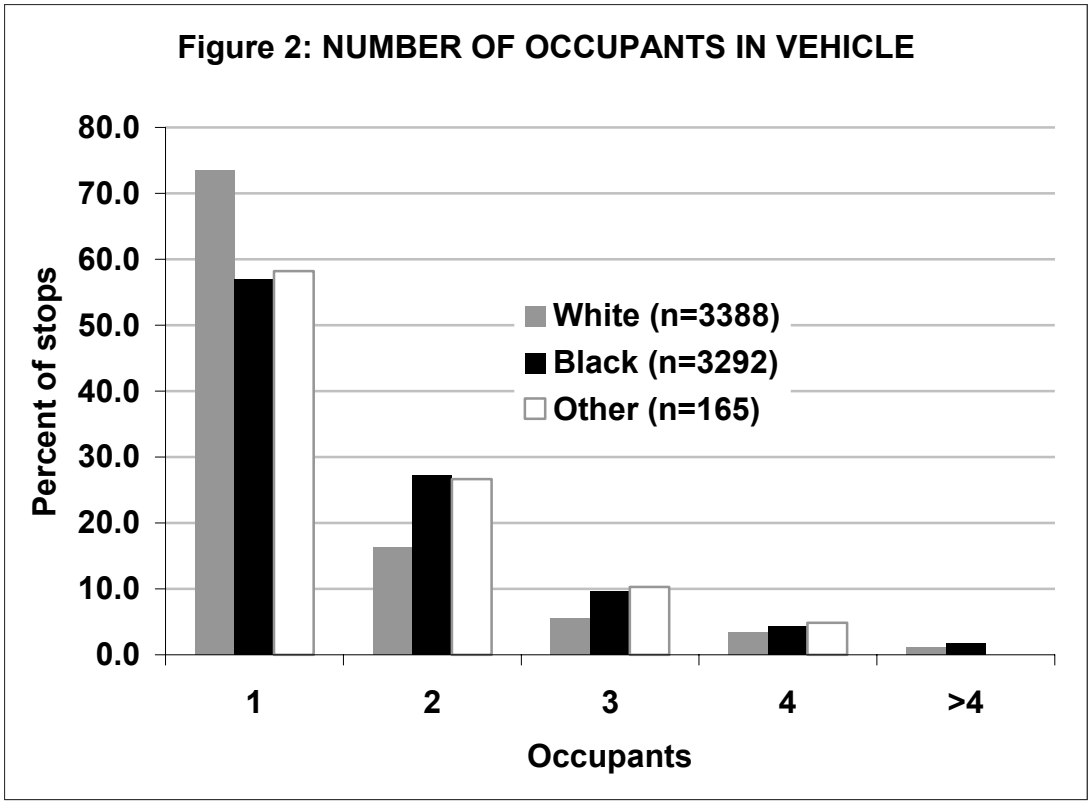


Figure 2: NUMBER OF OCCUPANTS IN VEHICLE
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Percent of stops
White (n=3388)
Black (n=3292)
Other (n=165)
1
2
3
4
>4
Occupants

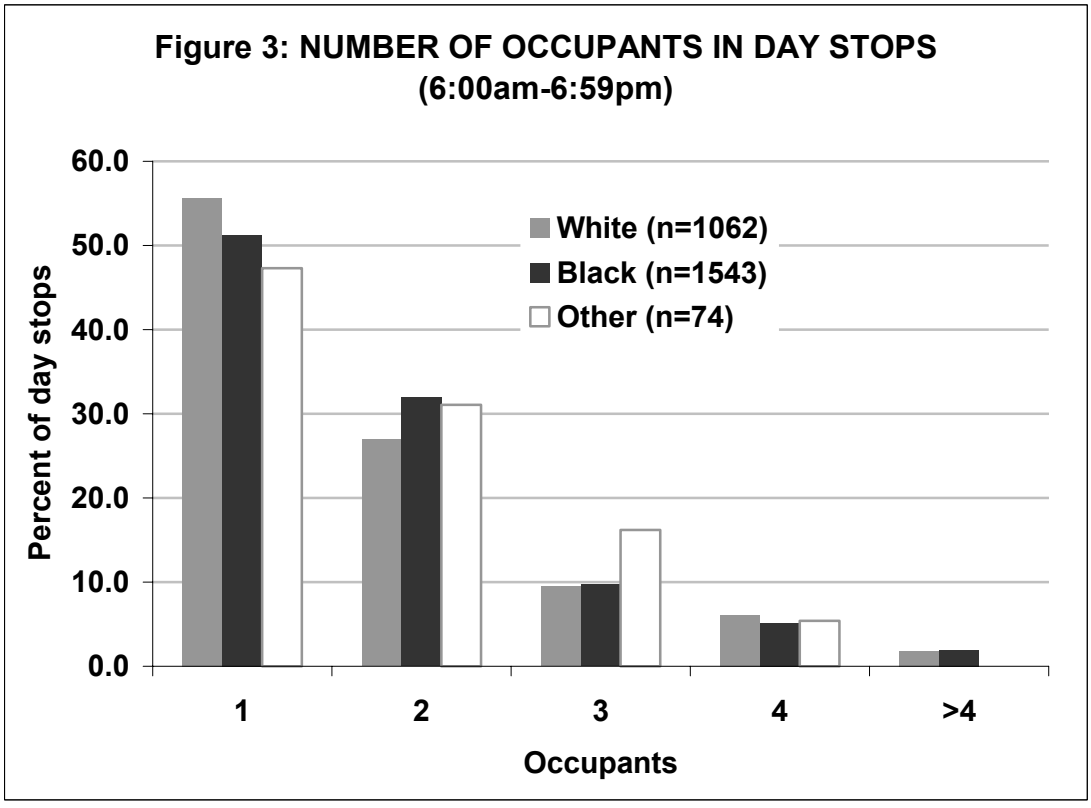
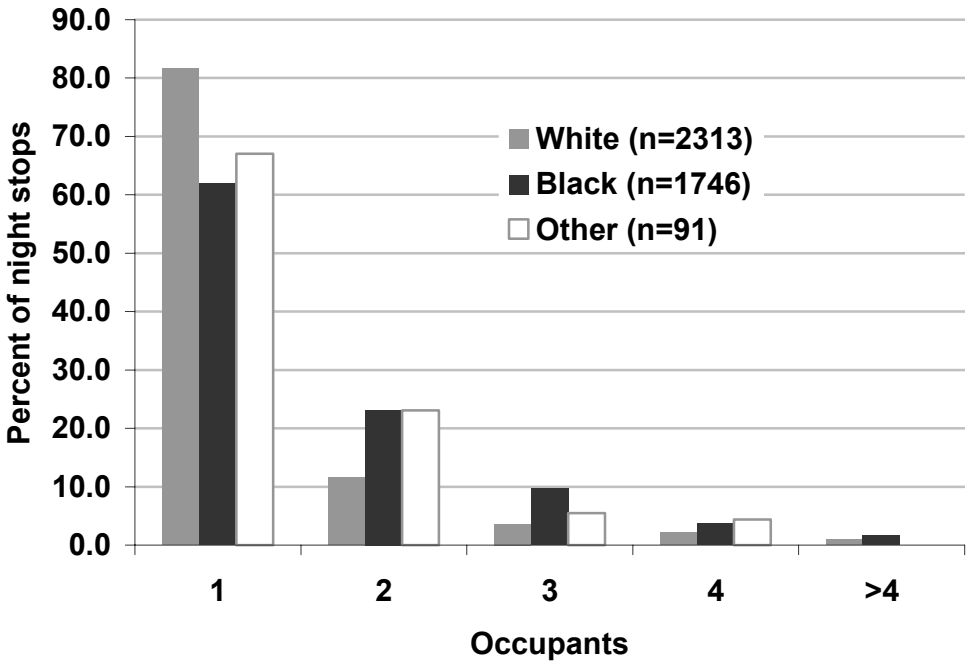


Figure 3: NUMBER OF OCCUPANTS IN DAY STOPS
(6:00am-6:59pm)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Percent of day stops
White (n=1062)
Black (n=1543)
Other (n=74)
1
2
3
4
>4
Occupants

Figure 4: NUMBER OF OCCUPANTS IN NIGHT STOPS (7:00pm-5:59am)



III. WHY WERE VEHICLES STOPPED?

The field contact card lists six reasons for a vehicle stop:

1. Moving violations include driving over the speed limit, making illegal turns, and other violations of traffic laws;
2. Equipment violations include non-functioning taillights, missing license tags, and similar problems.
3. Criminal offense includes the situations in which the occupants of the vehicle are suspected of a criminal act;
4. Suspect and vehicle description include situations in which the vehicle or the occupants appear to fit the description of people involved in some violation;
5. Stolen automobile involve situations where the officer making the stop believes the vehicle to be stolen;
6. Other reasons are not specified; and
7. Finally, officers may have failed to record a reason, so these are listed as "none".

Table 5 shows the frequency with which these reasons were recorded by officers (from most to least), and how the reasons vary by race. Moving violations account for over 70 percent of the reasons for stops. Stolen autos were the least frequent reason for stops. Within this pattern of similarity between Whites and African-Americans, there are also differences. Whites that are stopped are more likely to be stopped for moving violations than African-Americans. And, Whites were more likely than African-Americans to have "none" recorded on the contact card. African-Americans were more likely than Whites to be stopped for the other four reasons listed.

Table 5: REASONS FOR VEHICLE STOPS BY RACE

	White	Black	Other	All
Moving Violation	81.35	61.85	81.76	71.89
	(2840)	(2140)	(139)	(5119)
Equipment Violation	7.53	15.58	8.24	11.46
	(263)	(539)	(14)	(816)
Other Reason	3.15	7.69	1.18	5.31
	(110)	(266)	(2)	(378)
Criminal Offense	3.87	5.32	2.35	4.54
	(135)	(184)	(4)	(323)
Suspect/Vehicle	1.80	5.00	2.35	3.37
Description	(63)	(173)	(4)	(240)
None	2.23	1.73	4.12	2.04
	(78)	(60)	(7)	(145)
Stolen Auto	0.06	2.83	0.00	1.40
	(2)	(98)	(0)	(100)
Total	100.00	100.00	100.00	100.00
	(3491)	(3460)	(170)	(7121)

These six reasons for stops were combined into two categories: crime and non-crime. Crime includes criminal offense, suspect/vehicle description, and stolen auto. Non-crime contains all stops made for the other reasons: moving and equipment violations, other, and no reason given. Table 6 shows that non-crime reasons for stops are the rule for both African-Americans and Whites, but African-Americans are over twice as likely to be stopped for crime- related reasons than Whites.

Table 6: PERCENT OF CRIME RELATED STOPS BY RACE

	White	Black	Other	All
Non-Crime	94.3	86.8	95.3	90.7
	(3291)	(3005)	(162)	(6458)
Crime	5.7	13.2	4.7	9.3
	(200)	(455)	(8)	(663)
Total	100.0	100.0	100.0	100.0
	(3491)	(3460)	(170)	(7121)

In Figures 5 and 6 we show how reasons for stops varies by race, given either a non-crime stop (Figure 5) or a crime stop (Figure 6). Figures 5 shows that the most common non-crime reason for stops for African-Americans and Whites are moving violations. Whites are less likely than African-Americans to be stopped for an equipment violation. Figure 6 shows that even though Whites are less likely to be stopped for a crime reason than African-Americans, if they are stopped for a crime reason, Whites are far more likely to be stopped for a criminal offense than African-Americans. Individuals in both groups are about equally likely to be stopped for a vehicle-suspect description or auto theft, if they are stopped for crime reasons.

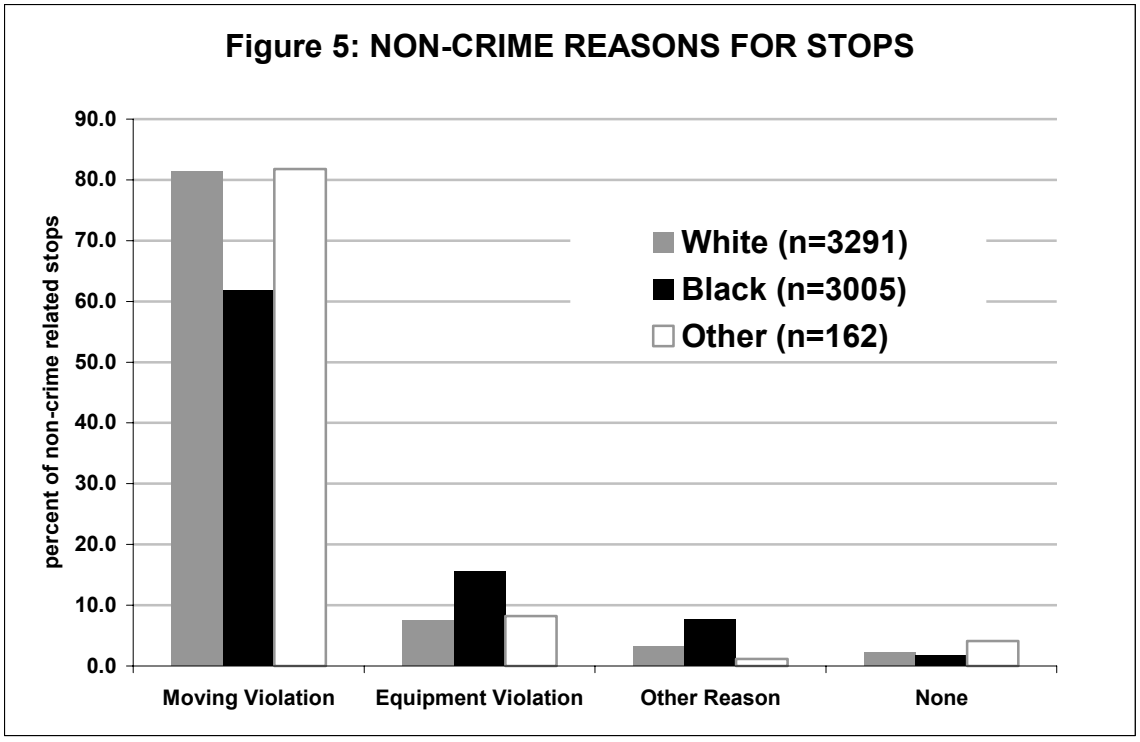


Figure 5: NON-CRIME REASONS FOR STOPS
percent of non-crime related stops
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
White (n=3291)
Black (n=3005)
Other (n=162)
Moving Violation
Equipment Violation
Other Reason
None

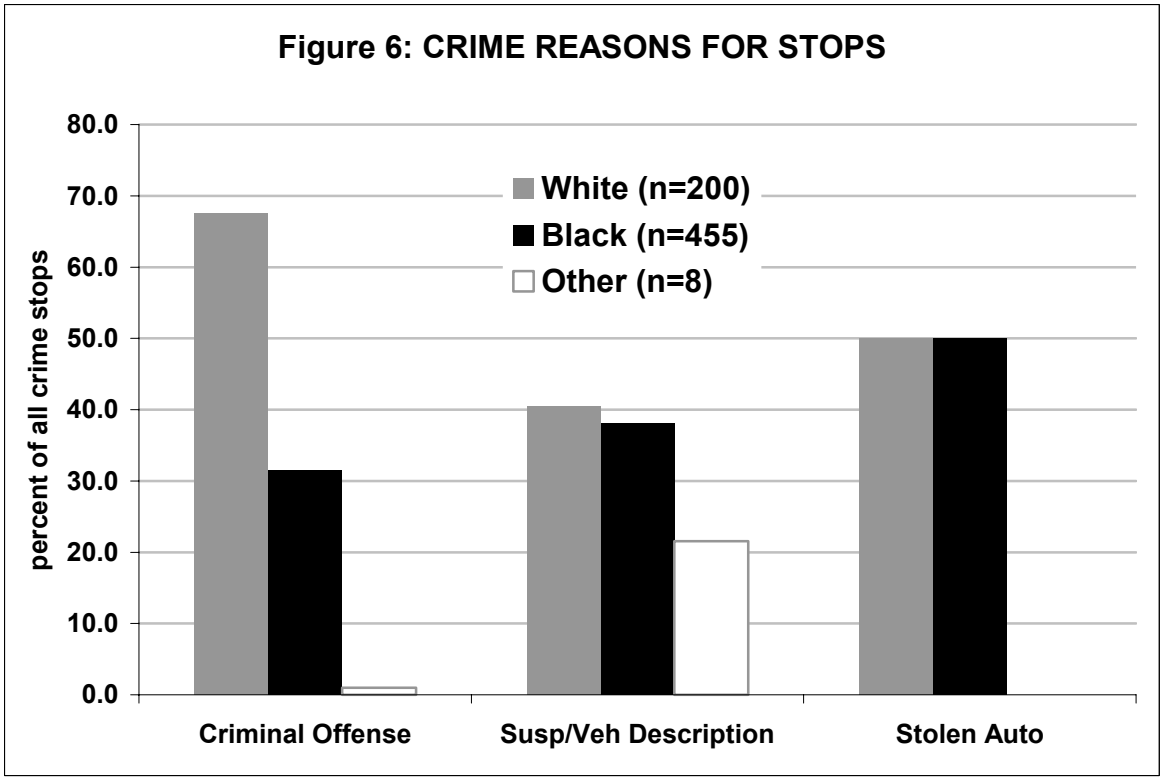


Figure 6: CRIME REASONS FOR STOPS
percent of all crime stops
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
White (n=200)
Black (n=455)
Other (n=8)
Criminal Offense
Susp/Veh Description
Stolen Auto

IV. HOW MUCH DISPROPORTIONALITY IN STOPS IS THERE?

In absolute numbers, Whites are stopped about as often as African-Americans (see Table 7). However, there are more Whites living in the city than African-Americans. According to the 2000 census, Whites comprise 56 percent of the city driving population, and African-Americans comprise 40 percent. We defined driving population as people ages 15 and older. The geographical distribution of driving population for African-Americans and Whites is displayed in Map 1. If the populations are unequal, but the two populations are similar in all other respects, then we would expect the proportion of Whites stopped compared to their numbers in the population to be similar to the proportion of African-Americans stopped compared to their numbers in the population. Using the 2000 census figures for people ages 15 and older, we see that the proportion of Whites stopped is not equal to the proportion of African-Americans stopped (Table 7). For the average White motorist stopped within the 6 months studied, there is less than a 3 percent chance of being stopped. For the average African-American driver in this same time period, there is less than a 4 percent chance of being stopped. There is, in short, some basic disproportionality in police stops.

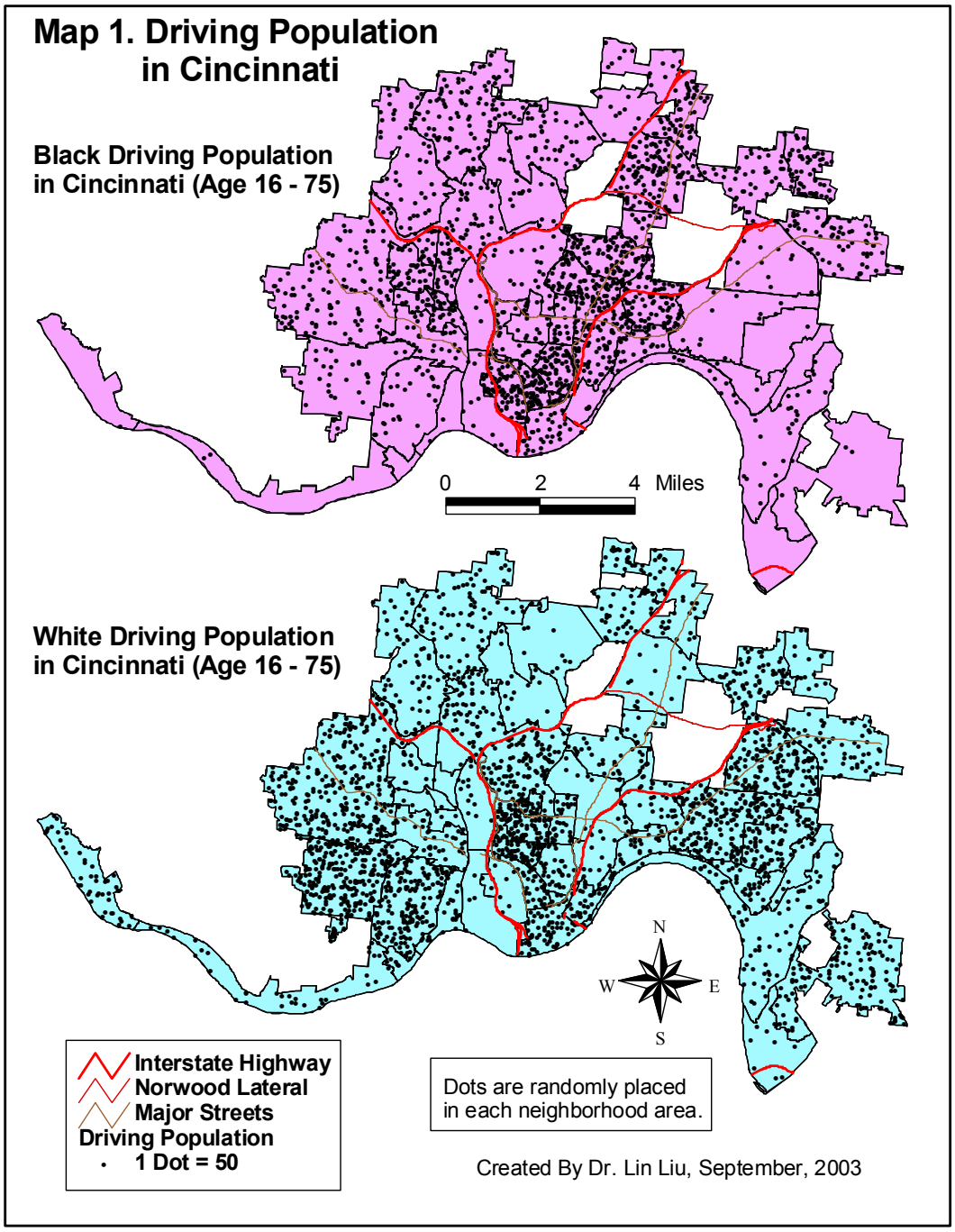
Table 7: PROPORTION OF RACES STOPPED

	Stops (Contact Cards)	Percent of total stops	Driving Population (2000 Census)	Percent of total population	Percent of population stopped
Whites	3491	49.02	131,271	55.92	2.66
Blacks	3460	48.59	93,978	40.04	3.68
Other	170	02.39	9,486	4.04	1.79
All	7121	100.00	234,735	100.00	3.03

There are several things wrong with this analysis, at this stage. Some of these we can adjust for to make better estimates of disproportionality, and others we cannot adjust for, so we must live with the uncertainty.

These census figures do not consider that African-Americans may have been significantly undercounted in the 2000 Census. If there are significantly more driving age African-Americans living in Cincinnati than counted by the census, then the level of African-American disproportionality is less than shown in Table7. Undercounting of Whites would produce the opposite effect.

Second, there is considerable commuter traffic into and out of Cincinnati. The police sometimes stop these individuals. So, the “at risk” population is not just the resident population. To the extent that Whites commute into and through Cincinnati in greater numbers than do African-Americans, then not accounting for this will underestimate African-American disproportionality. For this reason, we



put considerable effort into estimating the commuter population and its racial composition. We will describe this later, but for now we must note that these estimates are not perfect, so measures of disproportionality based on them will not be precise. Though we have attempted to adjust for the daily rhythm of commuting, we could not adjust for other events that bring people into the city on

a more sporadic basis. We do not know if such people are more likely to be White or African-American.

But perhaps the most troublesome issue is how to adjust for differences in prevalence in deviant behavior that the police may observe. This is a controversial issue in itself, though it should not be. We know from innumerable studies that crime is concentrated in poorer neighborhoods and in the United States such neighborhoods tend to have high concentrations of African-Americans. Cincinnati is like many other cities in this regard. Such neighborhoods also tend to place greater demand on police services, apart from crime. The result is twofold. First, more police are deployed to these neighborhoods because there is more police work in such neighborhoods. This increases the exposure of drivers to police officers. So, an individual engaged in a traffic infraction who might not be noticed in a low crime neighborhood with few police is more likely to be noticed in a high crime neighborhood with many police. Offsetting this, however, is the fact that the police are busier, despite their greater numbers, so they may overlook some infractions. The second effect is that with more crimes police will make more stops of suspicious individuals. Some of these stops will result from citizens reporting and some will result from actions initiated by the police themselves.

To address these issues we use maps to show where stops take place. We also adjusted the base population by the miles driven by African-Americans and Whites. We then measured disproportionality in each neighborhood. Finally, we compared maps of stops and disproportionality to maps of crime, drug calls, calls for police services, and traffic accidents. We describe these procedures and results next.

A. Locating Vehicle Stops

Using mapping software, we attempted to place each vehicle stop on a computerized street network map provided by the Cincinnati Area Geographic Information Systems (CAGIS). We matched the address of each vehicle stop to a corresponding street on the map. The exact location of the stop was determined by a linear interpolation process that fitted the address number of the stop to its position in the address range of the street. Even address numbers are placed to one side of the street and odd numbers to the other side. This process is called geo-coding.

About 5 percent of the stops could not be geo-coded due to the following reasons:

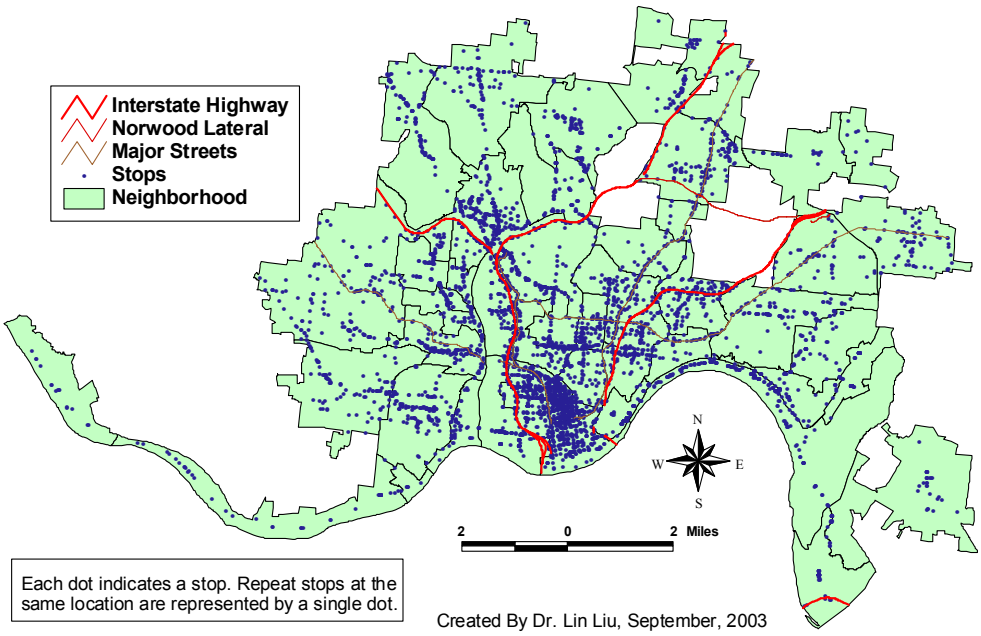
- The street listed on the contact cards did not correspond to a street on the computer map;
- The address number listed on the contact card were outside of the address range of the street; and
- The address on contact cards is outside of the City of Cincinnati.

A 95 percent geo-coding rate is well within acceptable limits for data of this type.

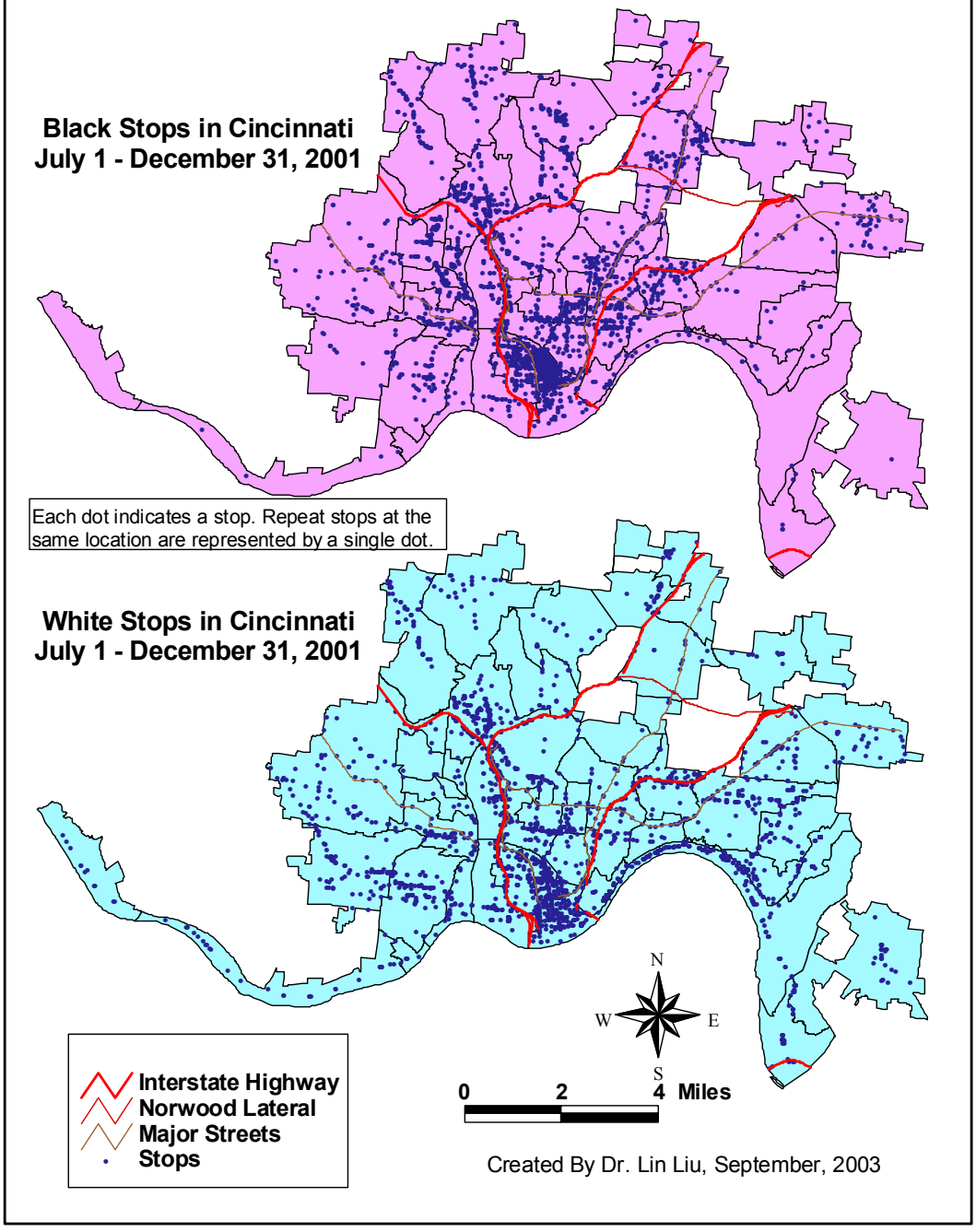
We then matched the geo-coded stops to the occupant database to obtain occupant information for each stop. A small number of stops did not have occupant information. The total number of vehicle stops in this part of the analysis is 6,854.

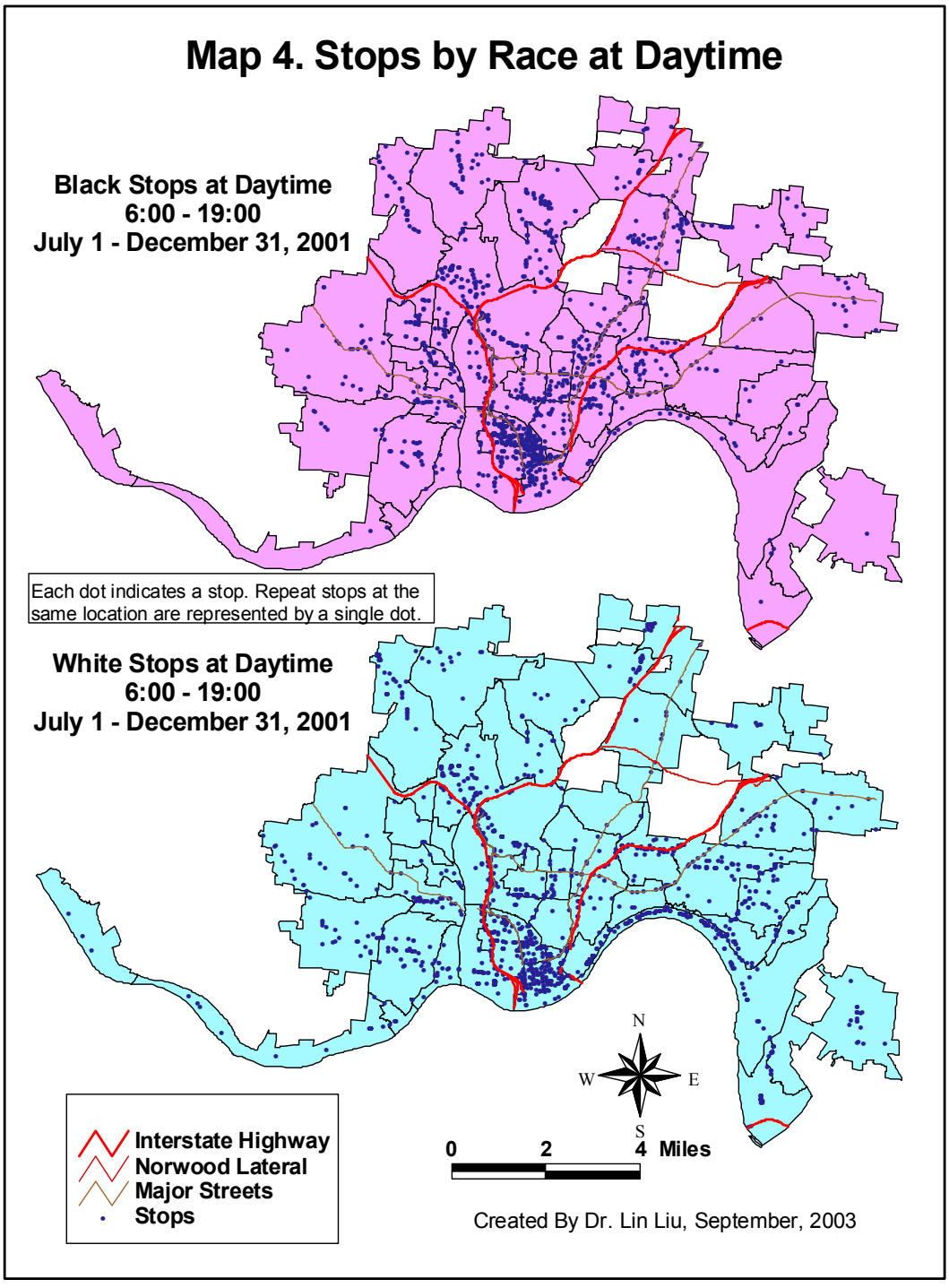
Maps 2, 3, 4, and 5 show total vehicle stops, stops by race, and stops by day and night. The dots on these maps reflect the actual location of stops. However multiple stops at the same location are represented as a single dot. To better demonstrate the overall geographic distribution of stop, we mapped the density of vehicle stops (Maps 6, 7, 8, and 9). Density is measured as the number of stops per square mile. Though there is substantial geographic overlap between African-American and White stops (particularly in and around the central business district, and the I-75 corridor from downtown to Northside), there are important differences. In particular, White stops are somewhat more heavily concentrated along major commuter routes than are African-American stops. These differences are reflected in day and night stops for both races.

Map 2. Police Vehicle Stops in Cincinnati
July 1 - December 31, 2001

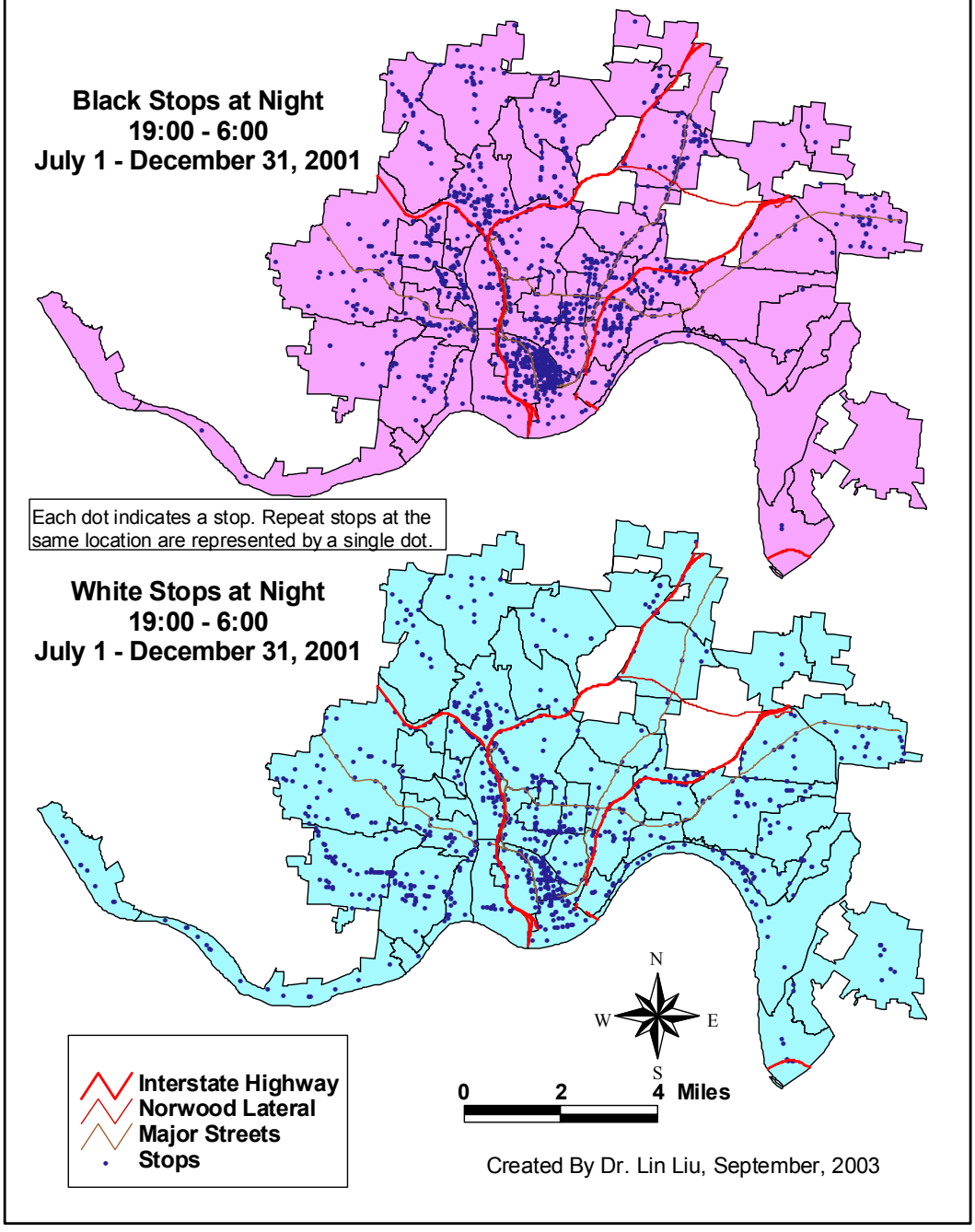


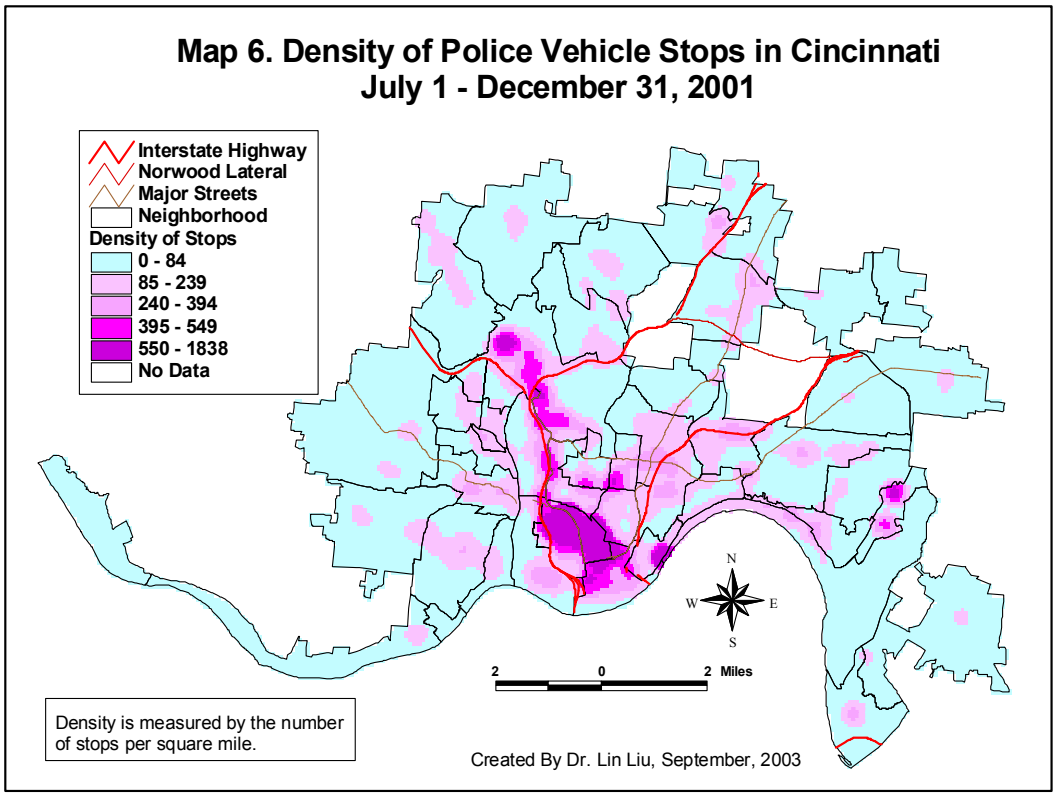
Map 3. Stops by Race



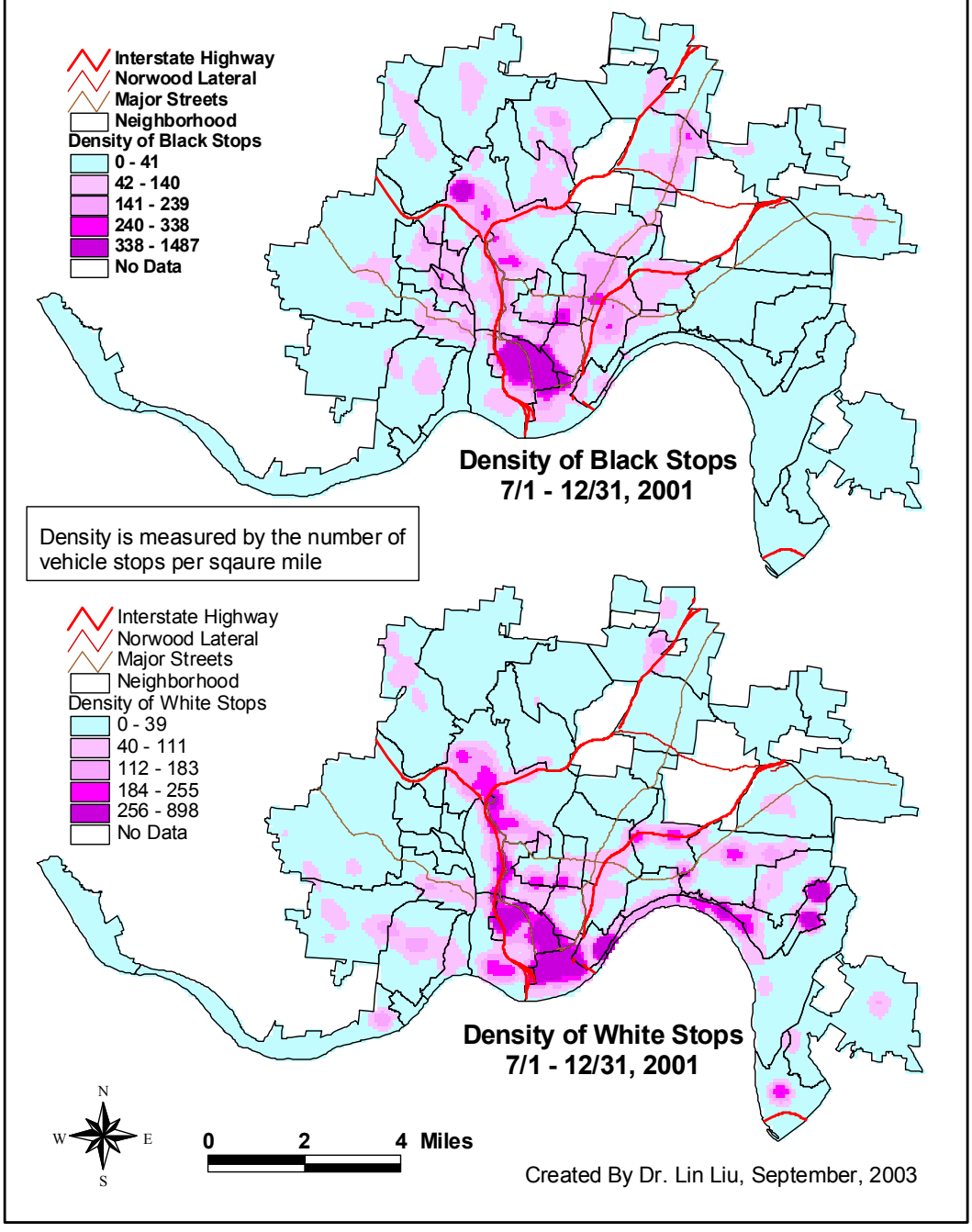

Map 4. Stops by Race at Daytime
Black Stops at Daytime
6:00 - 19:00
July 1 - December 31, 2001
Each dot indicates a stop. Repeat stops at the same location are represented by a single dot.
White Stops at Daytime
6:00 - 19:00
July 1 - December 31, 2001
N
W
E
S
0
2
4 Miles
Interstate Highway
Norwood Lateral
Major Streets
Stops
Created By Dr. Lin Liu, September, 2003

Map 5. Stops by Race at Nighttime

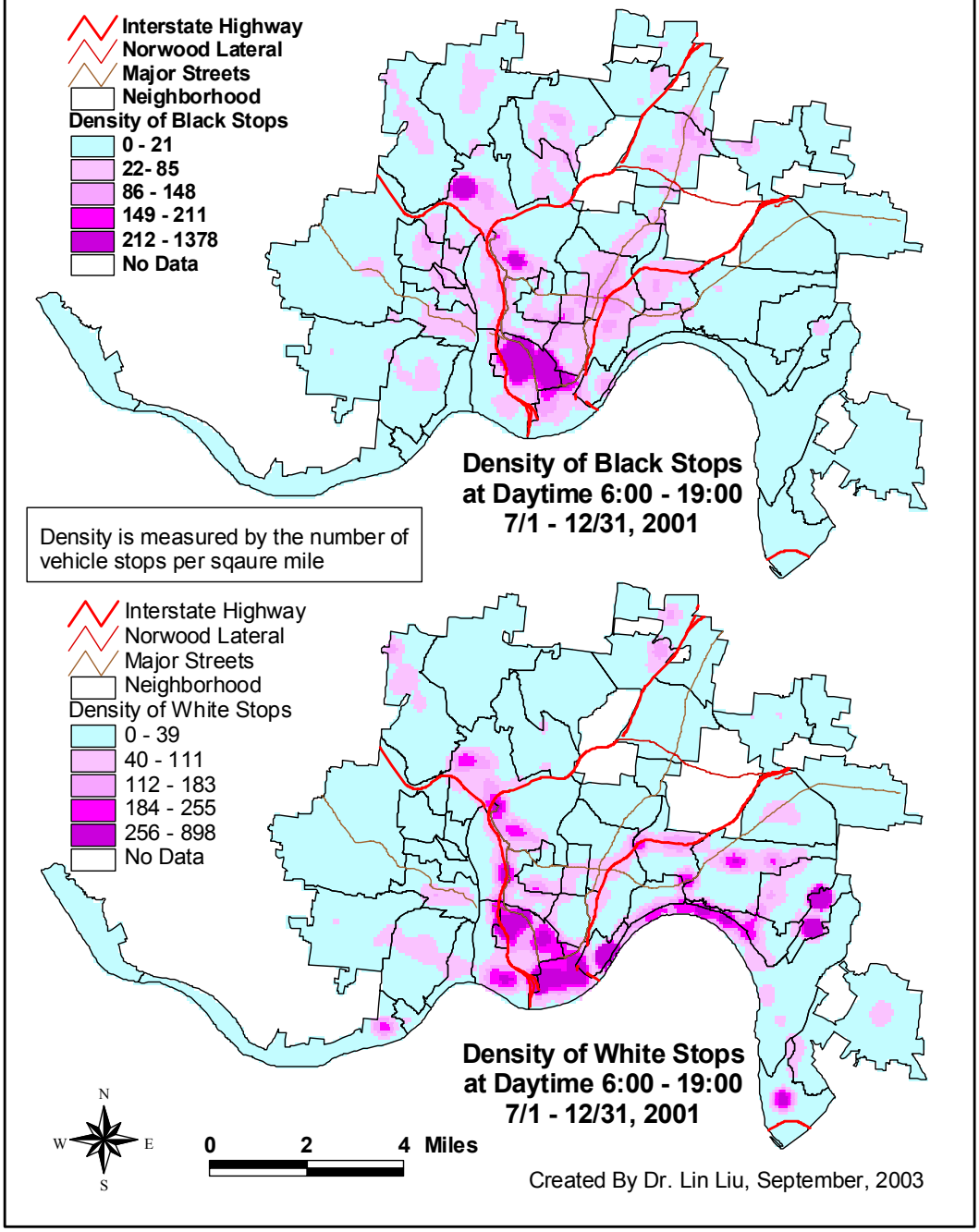


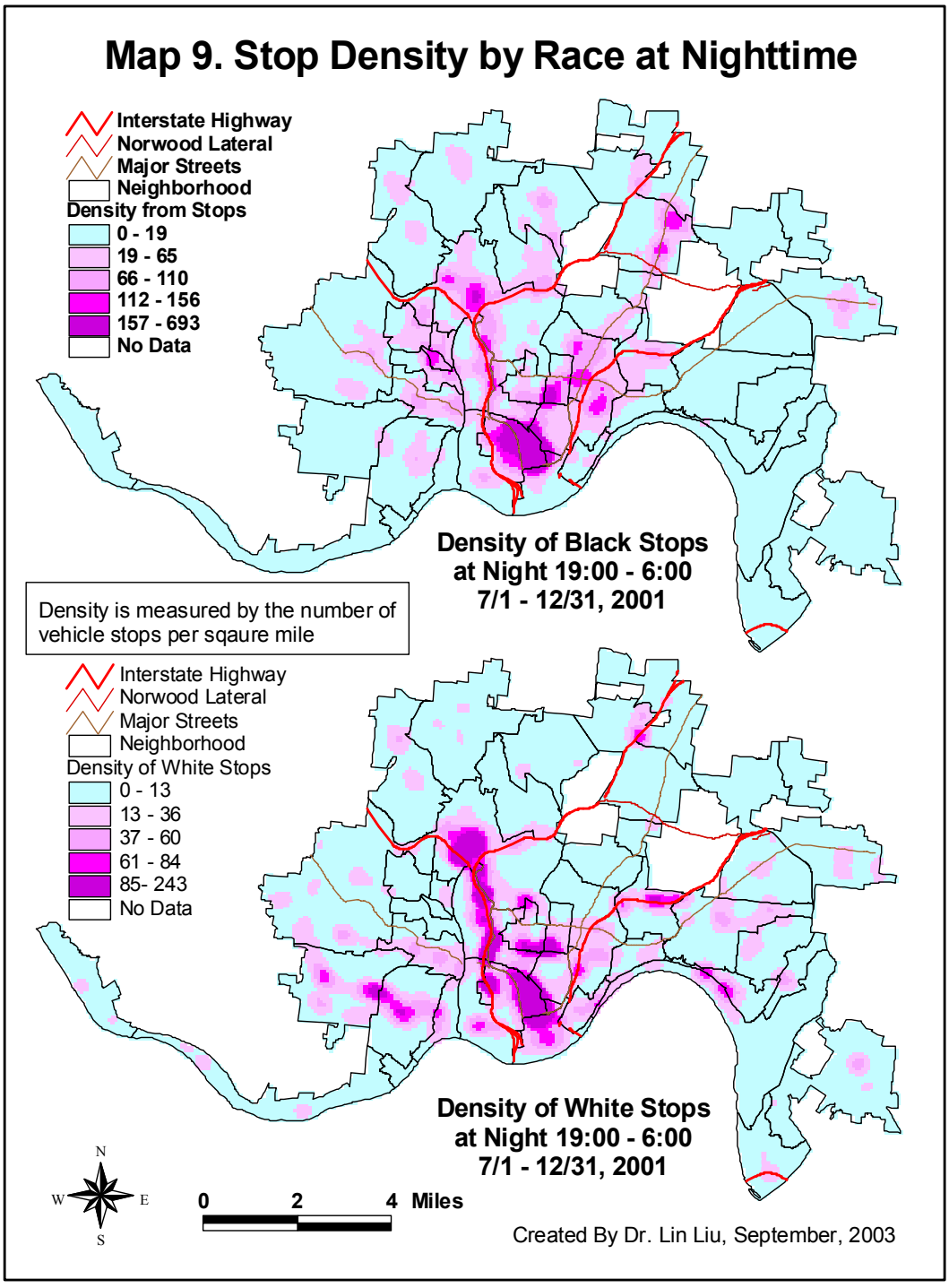

Map 6. Density of Police Vehicle Stops in Cincinnati
July 1 - December 31, 2001
Interstate Highway
Norwood Lateral
Major Streets
Neighborhood
Density of Stops
0 - 84
85 - 239
240 - 394
395 - 549
550 - 1838
No Data
N
W
E
S
2 0 2 Miles
Density is measured by the number of stops per square mile.
Created By Dr. Lin Liu, September, 2003

Map 7. Stop Density by Race



Map 8. Stop Density by Race at Daytime





B. Repeat Location of Vehicle Stops

We refer to a location where multiple stops occurred as a repeat location. Overall, 50 percent of stops are associated with locations where there are more than one stop (Table 8). For African American drivers only 34 percent of the stops are at repeat locations, compared to 52 for stops of White drivers. This

suggests that African American drivers are stopped at more locations and less frequently at each location as compared to White drivers.

Table 8: **REPEAT LOCATIONS FOR STOPS** (percent of total)

Locations with this many stops	White	Black	All
1	48.2	63.8	50.0
2	11.2	12.8	12.1
3	4.7	5.3	5.0
4	3.3	2.6	3.6
5	2.9	1.5	2.3
6	3.2	1.6	2.9
7	2.4	1.3	2.1
8	2.5	0.5	1.3
9	0.3	0.3	1.2
10	1.9	1.2	1.6
>10	19.4	9.1	17.7
Total	100.0	100.0	100.0
n	(3230)	(3336)	(6854)
2 or more	51.8	36.2	37.9

C. Calculation of Disproportionality Index

The disproportionality of Black stops is typically measured as a ratio of the number of Blacks stopped (Bs) to total number of stops (Ts) divided by Blacks base driving population (Bb) divided by the total base driving population (Tb):

Black disproportionality index = (Bs/Ts) / (Bb/Tb).

When the disproportionality index equals 1 there is no disproportionality. A disproportionality index larger than 1 suggests Blacks are stopped more frequently.

The count of stops in the numerator of the index comes from the geo-coded vehicle stops aggregated to Cincinnati neighborhood areas. The denominator, however, is very difficult to estimate. As noted above, raw census figures do not provide a valid way of measuring disproportionality, given commuting patterns. Our analysis indicates that the white/black driver ratio during commuting hours is about twice the ratio of the white/black residential driving population. Therefore, using population as the baseline will lead to incorrect conclusions.

We developed a new approach for estimating the baseline data. Instead of estimating the number of drivers by race, we estimate vehicle miles by race. This is approach not only takes into account people who live outside the city and

commute in or through Cincinnati, it also takes into account their exposure to police. A person driving 40 miles per day has more exposure to police than a person driving 5 miles per day. The vehicle miles in a region is the sum of miles driven by all drivers.

We used the average daily traffic counts from the Cincinnati City Traffic Engineering Department to estimate the total vehicle miles in each neighborhood. To obtain vehicle miles by race, we made the following assumptions:

- vehicle miles during rush hours are influenced by commuters;
- vehicle miles during daytime (excluding rush hours) are influenced by the daytime driving population;
- vehicle miles during nighttime are influenced by nighttime driving population,

1. Rush hours vehicle miles by race

Analysis of a sample detailed daily traffic counts suggested that, on average, traffic counts during rush hours contribute about 23 percent of the total daily traffic count. Therefore, it is reasonable to assume that 23 percent of the daily vehicle miles come from rush hours.

To obtain the race of drivers during rush hours we decided to send students to observe the rush hour traffic.[1] All student observers attended a one-hour in-class training of the procedure and outdoor experimental observations. All observers used a standard form to document the results of observation. The race of drivers is coded as "W" for Whites, "B" for Blacks, "O" for others, and "U" for undecided. The "U" counts were later distributed to the other three categories based on their proportions. A team of two observers was sent to every site. Team members simultaneously and independently observed 15 minutes of traffic in each direction of a street segment. A total of 126 sites were observed during late spring and early summer of 2002 and early spring and late summer of 2003. There are possible small over counts of Whites and Blacks because Hispanics may have been counted as either. Except for one site, the results of the two observers were consistent. The data from these observations were applied to estimate the rush hour vehicle miles of African-Americans and Whites during rush hours.

The remaining 77 percent of vehicle miles were divided evenly to daytime and nighttime. An even division is consistent with the general trend suggested by detailed daily traffic counts from the City Traffic Engineering Department.

2. Daytime vehicle miles by race

[1] We first explored using digital images/videos to capture rush hour traffic and analyze them on a computer. However, due to early sunlight, the quality of the digital images/videos was less than desirable and the results were not satisfactory.

In 1995 the U.S. Department of Transportation published a "trip table" documenting the number of people traveling from one traffic analysis zone (TAZ) to work in another TAZ. This table is based on the 1990 census. A table based on the 2000 census is not available. To estimate the trip table for 2000, we calibrated the 1990 trip table by using the daily traffic counts from the City Traffic Engineering Department and a recommended "bi-level traffic assignment optimization approach." This calibrated trip table together with 2000 census data provided us the estimates of daytime driving population by race for each neighborhood area. This race data was applied to 38.5 percent of the daily vehicle miles.

3. Nighttime vehicle miles by race

The race of drivers at night is influenced by the nighttime driving population, which we estimated from the 2000 census data. This race data is applied to the remaining 38.5 percent of the daily vehicle miles.

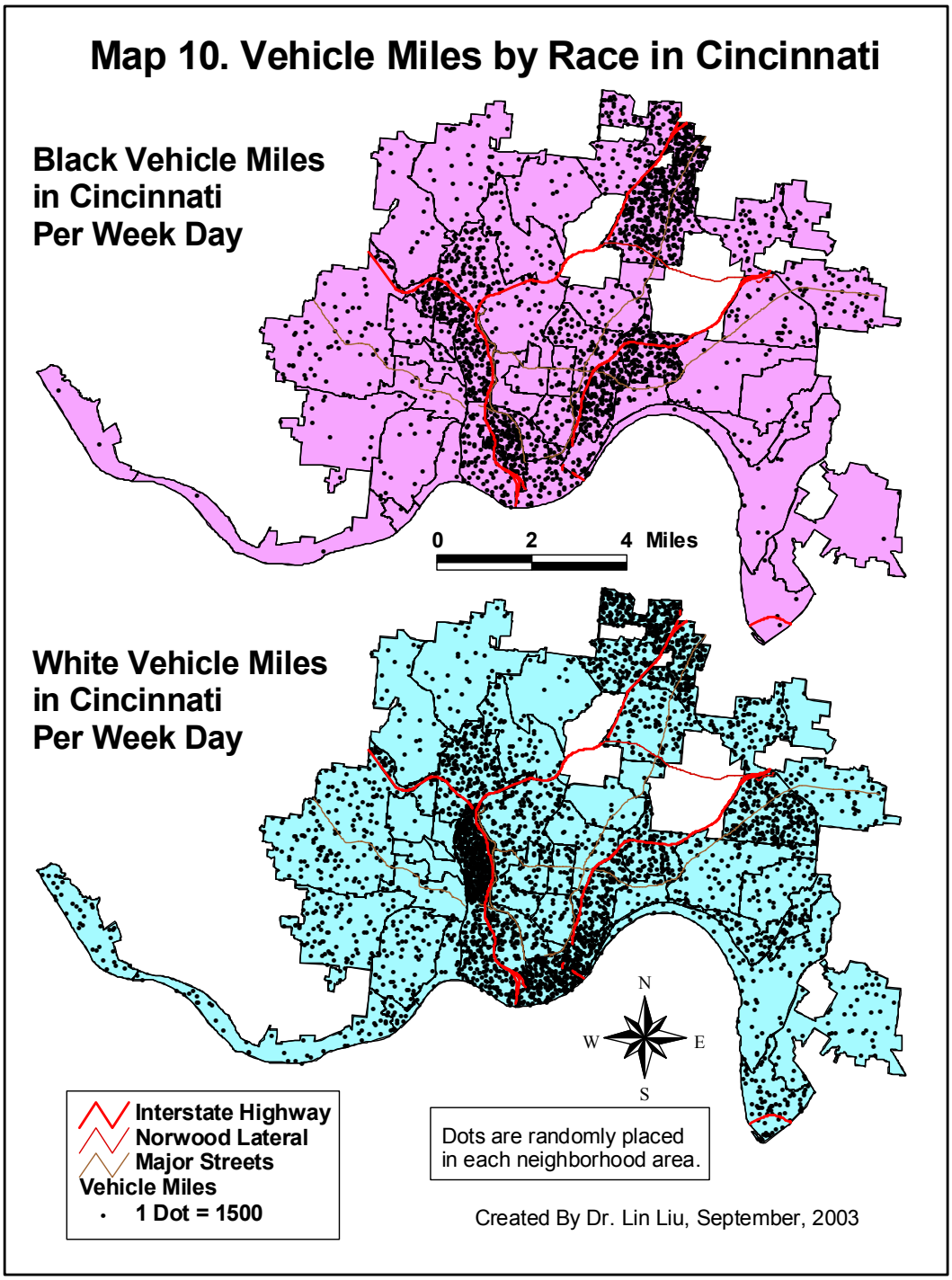
Adding the three components – rush hour, day non-rush hour, and night -- gives the total vehicle miles by race. The geographic distribution of the vehicle miles of African-Americans and Whites is displayed on Map 10. With the vehicle miles, the disproportionality index for Black stops was calculated using the formula above but substituting the vehicle miles of black driver (Bv) for the African-American population of a neighborhood and the total vehicle miles (Tv) for the total population of a neighborhood.

Black disproportionality index (based on vehicle miles) = (Bs/Ts) / (Bv/Tv).

The disproportionality index of Blacks by census driving population and by vehicle miles is shown in Table 9. The index is also represented as choropleth maps (Maps 11 and 12).

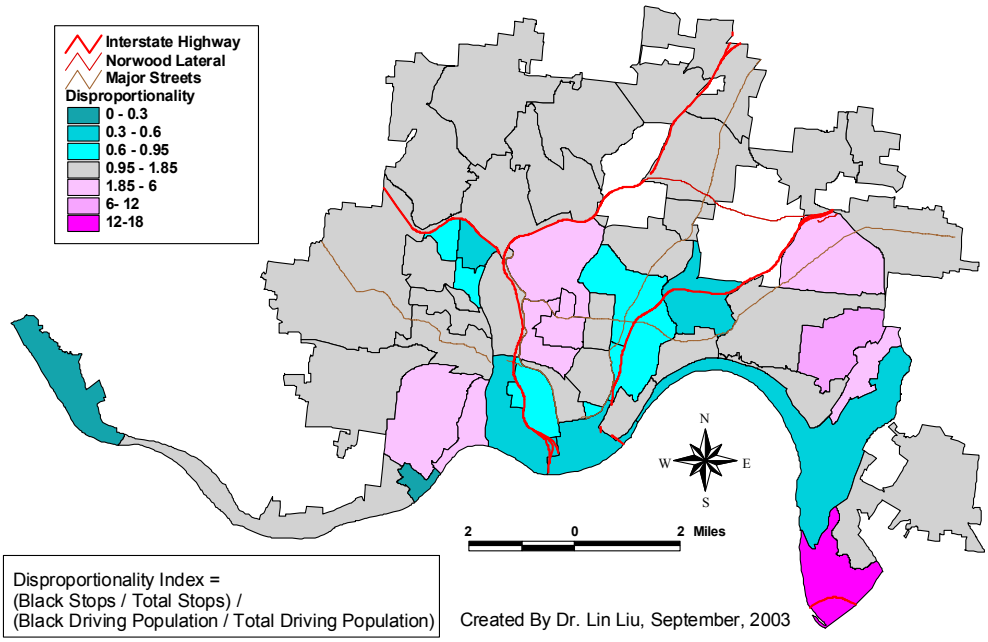
Though we believe that the estimates of disproportionality based on vehicle miles is more accurate than estimates based simply on census data, the index numbers should be considered only approximations. For this reason, more attention should be paid to broad groupings of neighborhoods than individual neighborhood index numbers.

To allow for small variation on either side of exact proportionality, we attributed the highest 5 percent of the interval from 0 to 1 and the smallest 5 percent of the interval from 1 and higher to a neutral category. Neighborhoods with a disproportionality index within this neutral interval have roughly proportional stopping of Whites and African-Americans. These 9 neighborhoods are shown on Map 12 and in Table 9 in gray.


Map 10. Vehicle Miles by Race in Cincinnati
Black Vehicle Miles
in Cincinnati
Per Week Day
0
2
4 Miles
White Vehicle Miles
in Cincinnati
Per Week Day
N
W
E
S
Interstate Highway
Norwood Lateral
Major Streets
Vehicle Miles
1 Dot = 1500
Dots are randomly placed
in each neighborhood area.
Created By Dr. Lin Liu, September, 2003

Nine neighborhoods had index numbers below the neutral interval, indicating disproportionate stopping of White drivers. Sedamsville and Sayler Park have an index of zero because no African-American drivers were stopped in these two neighborhood areas from July 1 to December 31 of 2001.

Map 11. Disproportionality Index for Stopped Black Drivers in Cincinnati Based on Driving Population, July 1 to December 31, 2001



Disproportionality Index =
(Black Stops / Total Stops) /
(Black Driving Population / Total Driving Population)

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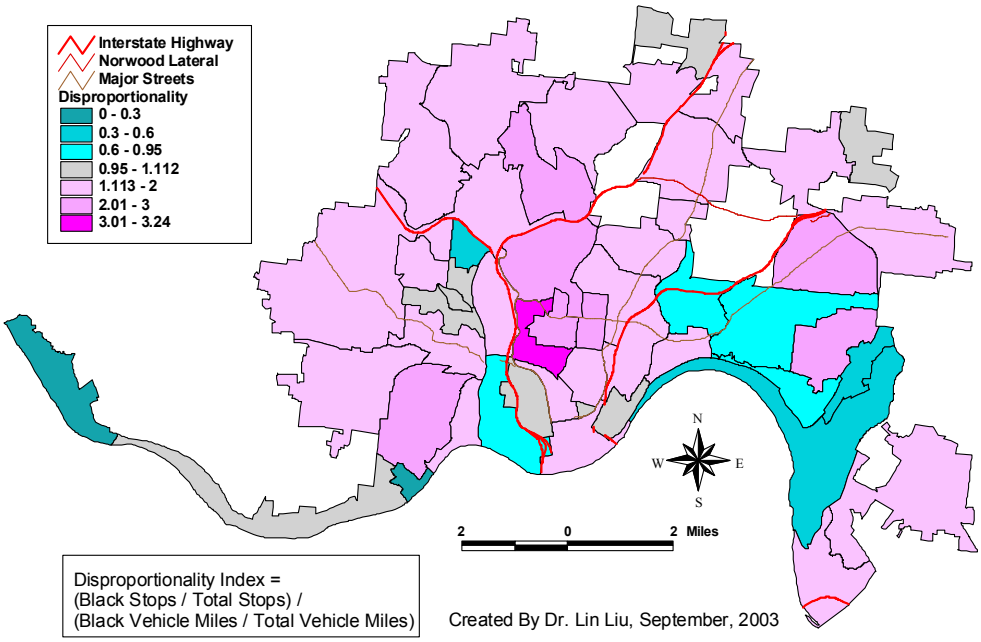
Map 12. Disproportionality Index for Stopped Black Drivers in Cincinnati Based on Vehicle Miles, July 1 to December 31, 2001



Thirty-four neighborhoods had index numbers above this neutral interval, indicating disproportionate stopping of African-American drivers. Of the 34 neighborhoods with notable African-American disproportionality, 25 had index numbers below two, indicating relatively low levels of disproportionality. The extreme high value of CUF may be an indication of an underlying problem, but it could be due to stops along several arterial routes along its periphery, or to errors in the estimation process.

Table 9: DISPROPORTIONALITY INDICES FOR CINCINNATI NEIGHBORHOODS
(ranked by vehicle mile index)

Neighborhood Areas	Based on **vehicle miles**	Based on **driving population**	Neighborhood Areas	Based on **vehicle miles**	Based on **driving population**
CUF	3.24	3.29	Bond Hill	1.25	0.98
Clifton	2.89	3.31	Madisonville	1.24	1.03
Mount Lookout	2.86	11.63	Over-The-Rhine	1.23	1.07
Clifton Heights	2.63	2.85	Walnut Hills	1.22	0.84
East Price Hill	2.32	2.79	Avondale	1.22	0.88
Winton Place	2.30	1.68	Roselawn	1.19	0.95
Oakley	2.16	3.02	Mount Washington	1.13	1.29
Corryville	2.04	1.61	Fay Apartments	1.12	0.91
Camp Washington	2.00	1.49	English Woods	1.11	1.02
Pleasant Ridge	1.88	1.70	Hartwell	1.11	1.10
Westwood	1.83	1.74	Millvale	1.10	0.90
Carthage	1.79	1.70	Riverside	1.10	1.13
Paddock Hills	1.75	1.48	Mount Adams	1.09	1.20
Northside	1.73	1.60	North Fairmount	1.07	1.05
California	1.71	17.80	Kennedy Heights	1.07	0.97
Lower Price Hill	1.69	3.06	West End	1.00	0.71
Mount Auburn	1.58	1.16	Pendleton	0.96	0.81
South Fairmount	1.55	1.40	Columbia Tusculum	0.93	1.21
Winton Hills	1.44	0.98	Queensgate	0.84	0.37
College Hill	1.37	1.28	Hyde Park	0.76	1.42
East Westwood	1.37	1.24	Evanston	0.67	0.52
North Avondale	1.35	1.13	Linwood	0.58	3.58
East Walnut Hills	1.34	1.06	South Cumminsville	0.48	0.36
West Price Hill	1.33	1.43	East End	0.39	0.58
CBD/Riverfront	1.28	0.56	Sayler Park	0.00	0.00
Mount Airy	1.27	1.09	Sedamsville	0.00	0.00

D. Explanation of Stops

Table 10 shows the correlation of vehicle stops with other race neutral factors, including traffic accidents (Maps 13 and 14), calls for service (CFS) (Map 15), drug-related calls (Map 16), serious (part 1) crimes (Map 17), and minor (part 2) crimes (Map 18). These correlations show how the vehicle stop rates in neighborhoods vary with each of these other factors. If the correlation between stops and a factor is greater than zero, then neighborhoods with more stops have more of the other factor, and vice versa. If the correlation is less than zero, then neighborhoods with more stops will have less of the other factor. If the correlation is zero, then there is no relationship between stops and the factor in question.

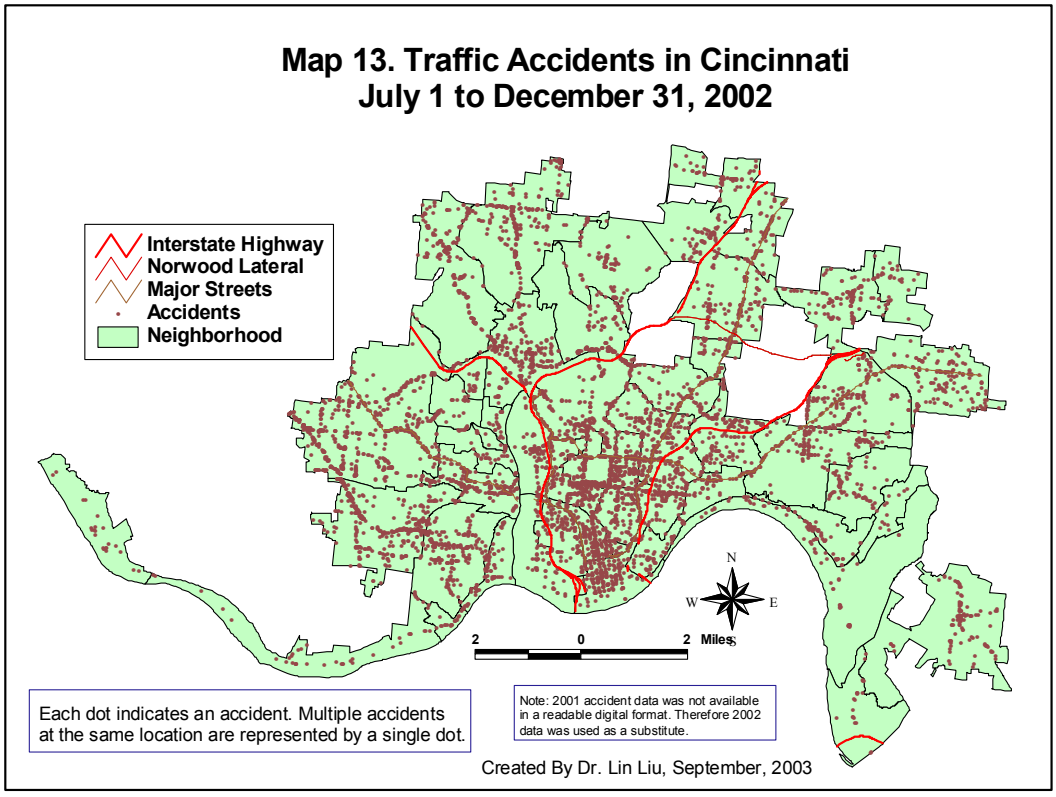
Table 10: CORRELATIONS OF VEHICLE STOPS WITH OTHER FACTORS (n=52 neighborhoods)						
	White stops/Vehicle mile		Black stops/Vehicle mile		All stops/Vehicle mile	
	Correlation	Significance	Correlation	Significance	Correlation	Significance
Accidents/ Vehicle mile	.322(*)	.020	.698(*)	.000	.484(*)	.000
Calls for service/ population	.445(*)	.001	.250	.074	.403(*)	.003
Drug Calls/ population	.265	.057	.200	.155	.292(*)	.036
Part I Crime/ population	.312(*)	.025	.176	.211	.277(*)	.047
Part II Crime/ population	.445(*)	.001	.309(*)	.026	.483(*)	.000
* Correlation is significant at the 0.05 level (2-tailed).						

Significance tests are used to rule out random fluctuations as a possible cause of a correlation. Significant correlations have little chance of being caused by randomness. In Table 10, significant correlations are marked with an asterisk (*). If a correlation is not significant, this means randomness may have been the cause, but we cannot be sure. Significance tests are particularly important with small numbers of cases. In this analysis neighborhoods are the cases, and there are only 52 of them. In Table 10, the numbers in the columns labeled "significance" give the probability that the adjacent correlation is due to random fluctuations. Probabilities of .05 and lower are deemed significant, by normal social science standards. So, for example, the correlation between White vehicle stops and Part I crimes (.312) is significant because there is only a .025 probability that a correlation of this size could have arisen by chance. However, the correlation between African-American stops and Part I crime (.176) is not significant because there is a .211 probability that a correlation of this size could have arisen by chance alone.

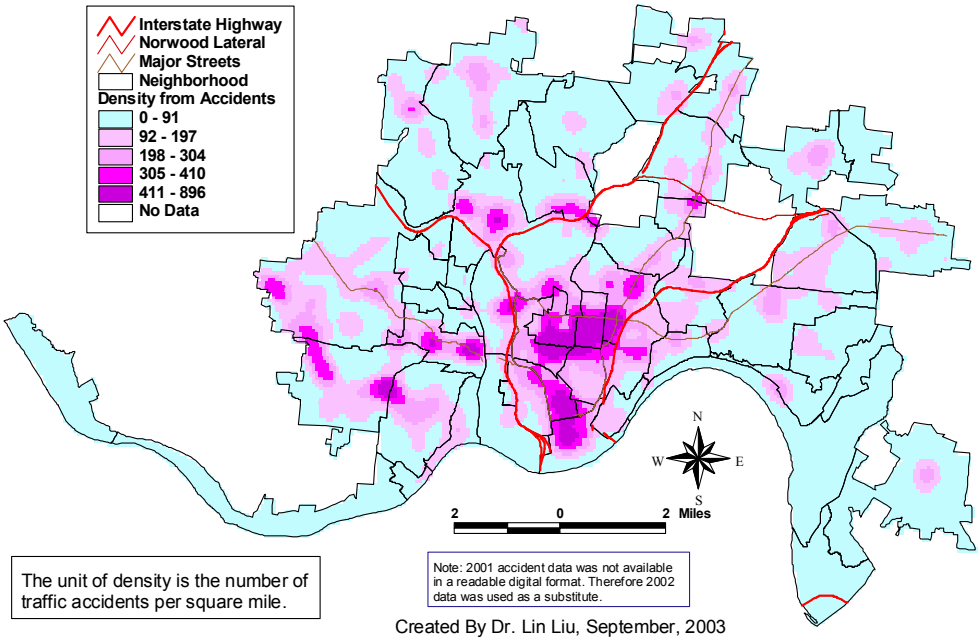
Each of the six factors measures a different type of police workload in a neighborhood. We would expect that as each increases, vehicle stops would increase (positive correlations), for two reasons. First, the more of these events the more police are in a neighborhood to deal with these events. This exposes neighborhood drivers to more police who might see misbehavior. Additionally, the police use these types of measures to determine how many officers to deploy to parts of the city. Second, as these events increase, police may become more proactive and use stops to prevent future occurrences. The importance of these

two explanations will vary by the type of workload. So for example, calls for service probably operates more by just bringing in more police to handle the calls, but may not have much effect on proactive police work. Drug calls and serious crime may influence traffic stops by both mechanisms.

We normalized stops by vehicle miles. For the workload factors, we normalized accidents by vehicle miles, the other factors we normalized by driving population. These normalizations remove the influence of varying population and/or vehicle miles in different neighborhoods. Total stops are significantly correlated to accidents, CFS, drug related calls, serious crime, and minor crime. Stops of African-American drivers are significantly correlated to accidents, and minor crime. Stops of White drivers are significantly correlated to accidents, CFS, serious crime, and minor crime. We do not have an explanation for the reasons for these differences in correlations across. We can say that to a large degree, vehicle stops are highly related to police workload factors in neighborhoods, in addition to vehicle miles driven. The implication of this finding is that at least some of the disproportionality identified above is due to demands on the police as expressed by higher rates of accidents, larger workloads, crime rates and drug calls.



Map 14. Density of Traffic Accidents in Cincinnati
July 1 - December 31, 2002



The unit of density is the number of traffic accidents per square mile.

Note: 2001 accident data was not available in a readable digital format. Therefore 2002 data was used as a substitute.

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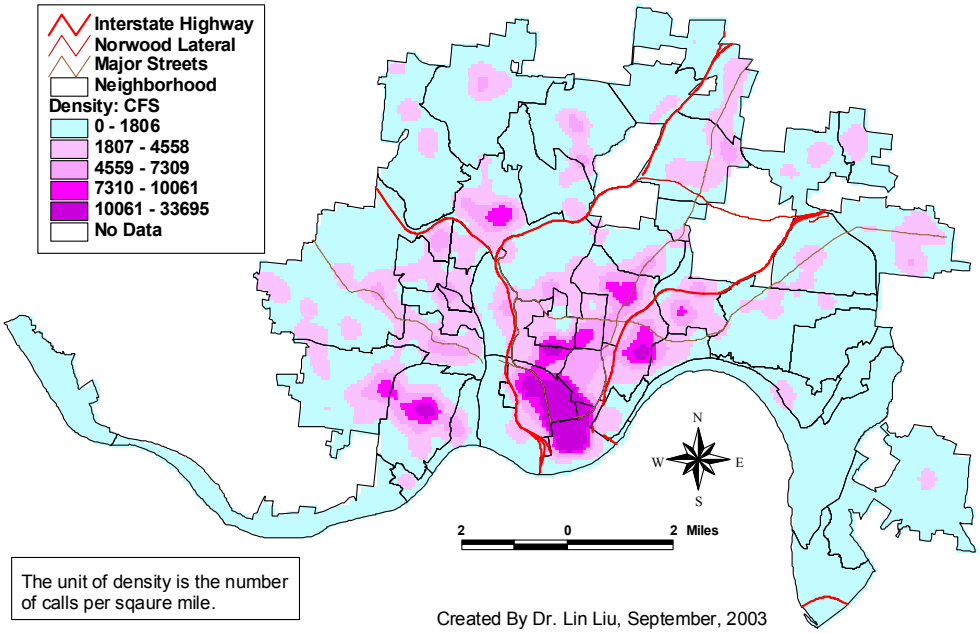
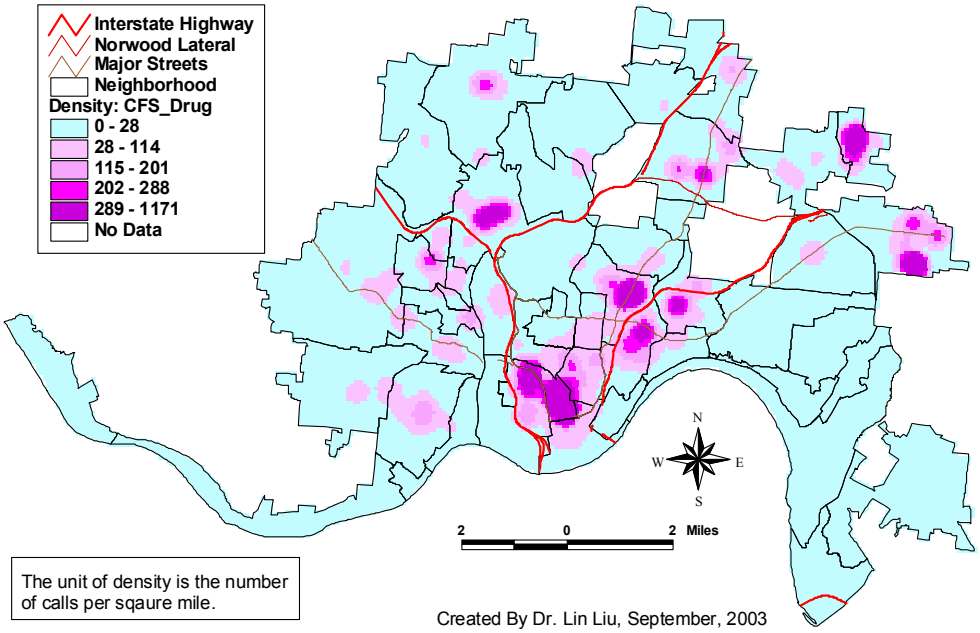
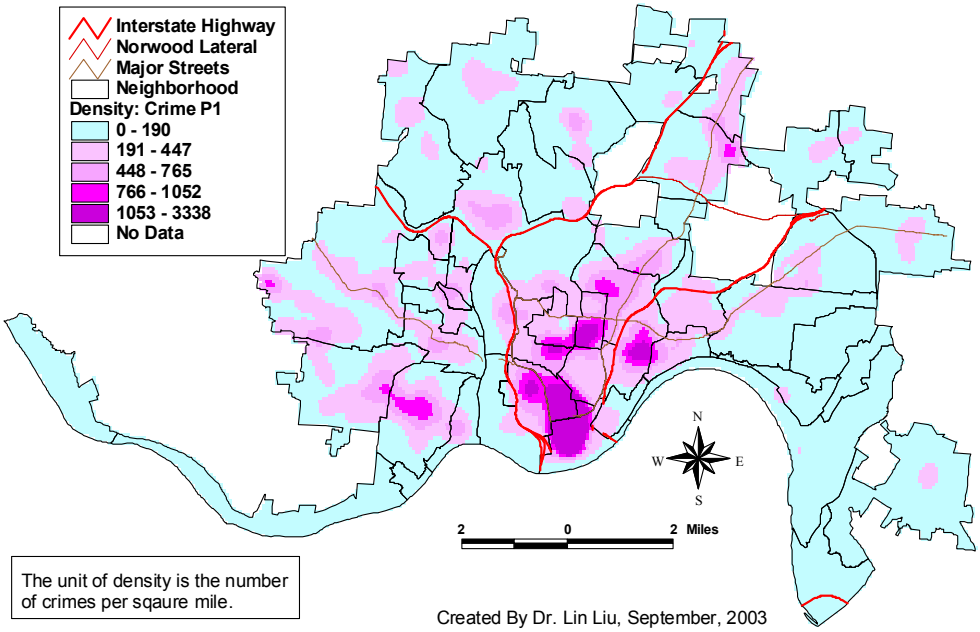
Map 15. Density of Calls for Service (CFS) in Cincinnati July 1- December 31, 2001



Map 16. Density of Drug Related Calls for Service (CFS) in Cincinnati
July 1 - December 31, 2001



Map 17. Density of Serious Crime (Part 1) in Cincinnati
July 1 - December 31, 2001



The unit of density is the number of crimes per sqaure mile.

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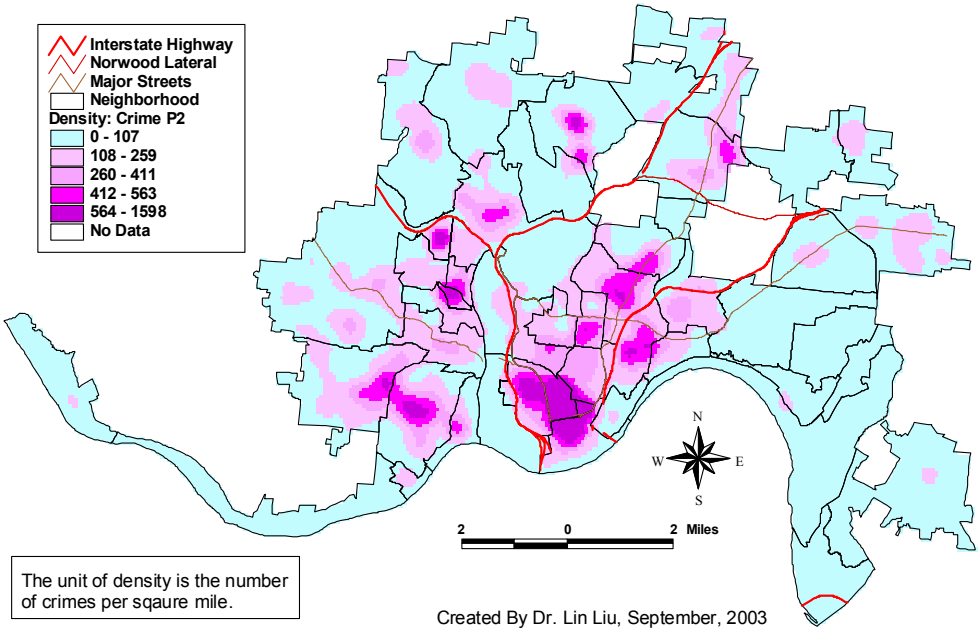
Map 18. Density of Minor Crime (Part 2) in Cincinnati
July 1 - December 31, 2001



The unit of density is the number of crimes per sqaure mile.

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V. WHAT HAPPENS AFTER POLICE STOPS?

The field stop card contains information on what occurred after the stop. This information includes how long the stop took, whether a citation (ticket) was issued, a citizen was arrested, and/or whether the officer searched an occupant or vehicle. In this section, we will examine this information and explore whether there are meaningful differences between White and African-American citizens with regard to these stop results.

A. How Long Are Stops?

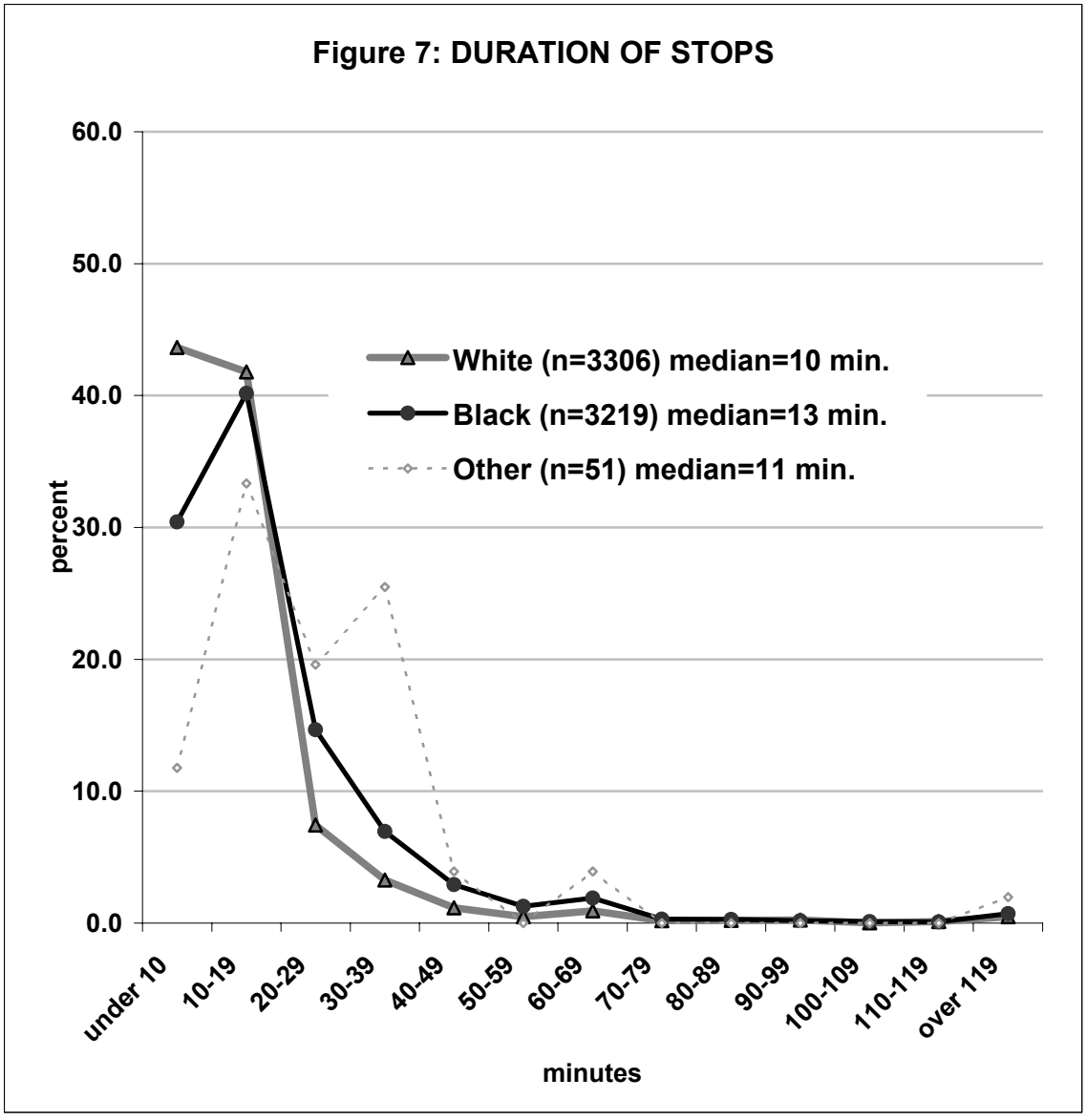
Over a third of the stops lasted under 10 minutes, and over 78 percent of the stops lasted less than 20 minutes. Less than 6 percent of the stops lasted 40 minutes or more. Because the duration of stops is highly concentrated toward the shorter times, a few exceptionally long stops can inflate the average. Therefore, the median statistic is better than the mean for showing the typical (average) stop duration. The median shows the division between the lower half and upper half of the data. Table 11 shows that half of the vehicles with White drivers had stop durations of less than 10 minutes. Half of the vehicles driven by an African American had durations of less than 13 minutes.

Table 11: DURATION OF STOPS (Minutes)

	Mean	Median	Bounds on Middle 50% of Stops		Range		n
			Lower	Upper	min	max	
All	15.50	10.00	7	17	1	650	6843
White	13.26	10.00	6	15	1	264	3390
Black	17.76	13.00	8	20	1	650	3285
Other	16.52	11.00	7	20	2	139	168

If we look at the longest 25% of the stops for vehicles driven by members of different races, we see that the longest stops for White driven vehicles were over 15 minutes in length. The longest stops of the African American driven vehicles were over 20 minutes.

These differences can be readily seen in Figure 7. White driven vehicles are more likely to have stops lasting in the 0-9 minute range than are African-American driven vehicles. African-American driven vehicles are more likely than White driven vehicles to have stops exceeding 19 minutes.



We tried to find an explanation for this three-minute difference. One possibility is that the difference in median stop duration is due to the nature of the stop. One would expect crime stops to be longer than non-crime stops, and as shown earlier, there is a higher proportion of African-American drivers involved in crime stops than is the case with White drivers. Table 12 shows the median stop durations for non-crime and crime incidents for each race. As expected, crime stops are longer on average than non-crime stops. Further, the differences between White and African-American stops change slightly. There is only a two-minute difference between Whites and African-Americans for non-crime stops, but a four-minute difference for crime stops.

Table 12: MEDIAN STOP DURATIONS BY RACE AND REASON FOR STOP		
	Non-Crime	Crime
All	10	15
White	10	13
Black	12	17
Other	20	21

Figures 8 and 9 show the distribution of the stop durations for non-crime and crime stops. The patterns are similar to the pattern shown in Figure 7. Though some of the differences in duration reported earlier may be due to differential involvement in crime stops, crime alone cannot explain most of the differences.

Another possible explanation is that when stops take place (day or night) influences duration. Table 13 shows that the differences between African-American and White stop durations narrow when time of day is taken into account. Night stops are shorter, on average, than day stops for both races.

Table 13: STOP DURATION BY DAY AND NIGHT (minutes)				
	Day		Night	
	n	median	n	median
White	1052	12	2311	9
Black	1533	13	1741	10
Other	74	15	92	10

A third explanation has to do with the number of occupants. Table 14 shows median stop times for each race for varying numbers of occupants. Vehicles with one person have shorter stop times, on average, than vehicles with several people regardless of race. A major reason for the longer stop duration for African-Americans has to do with the greater proportion of stopped African-American vehicles with multiple occupants.

Table 14: STOP DURATION BY NUMBER OF OCCUPANTS (minutes)						
	1		2		>2	
	n	median	n	median	n	median
White	2457	10	546	12	338	13
Black	1857	11	886	14	504	15
Other	95	10	44	15	25	20

Figure 8: NON-CRIME STOPS DURATIONS

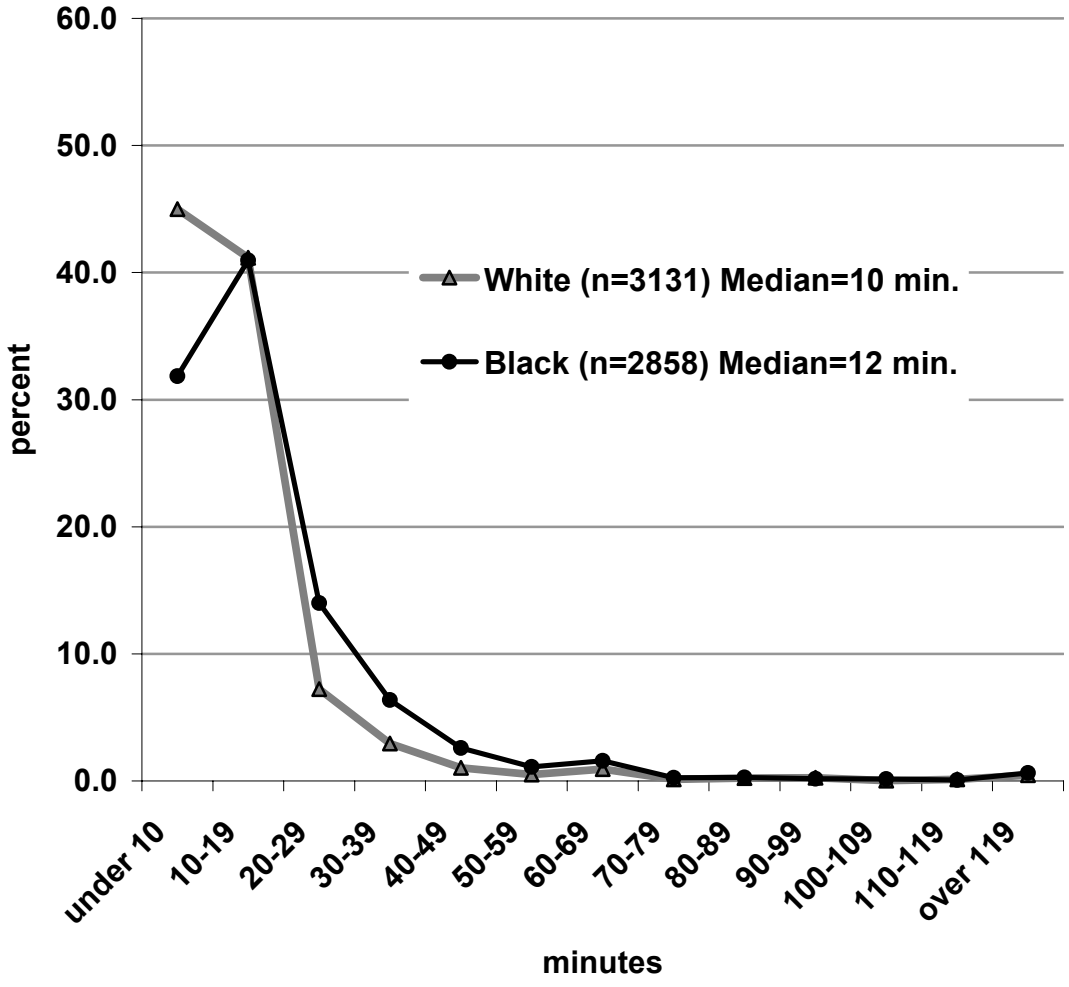
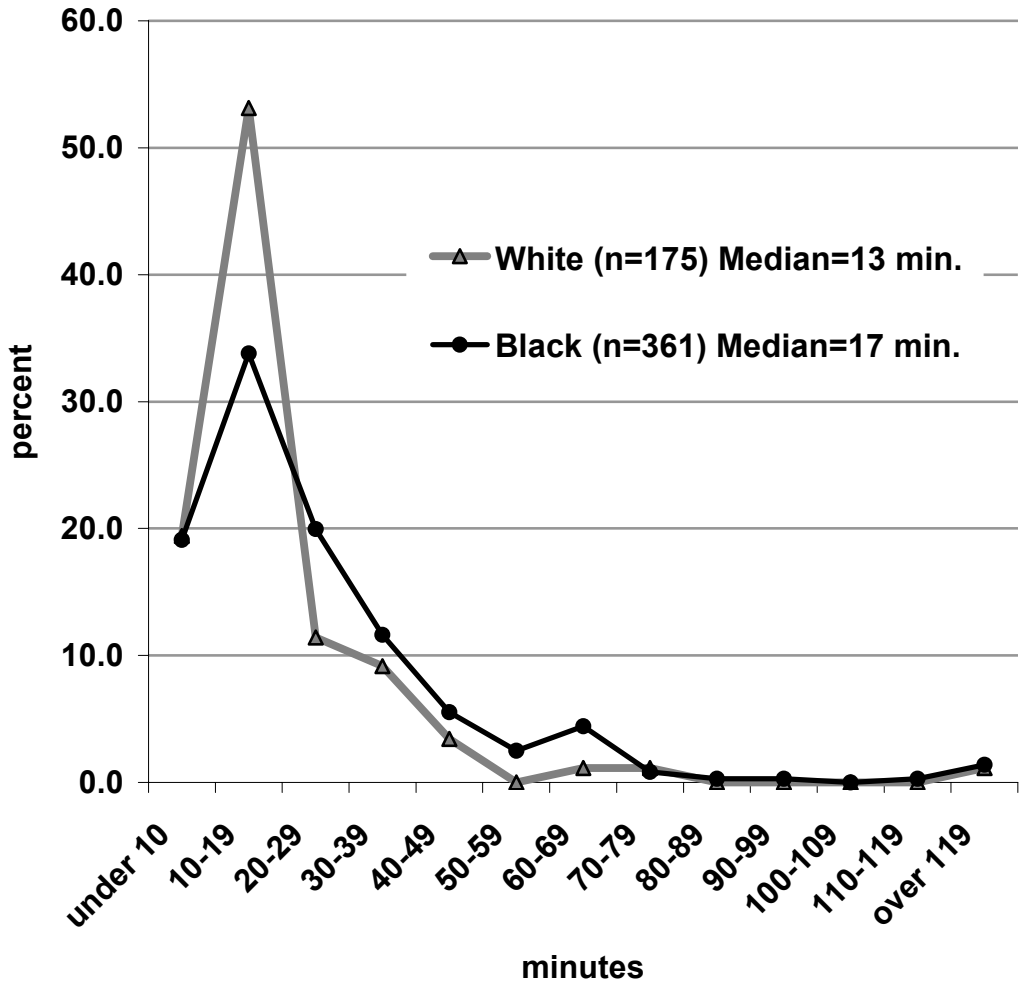


Figure 9: CRIME STOP DURATIONS



In summary, African-Americans have longer search durations, on average, than do Whites. Some of this may be due the fact that a greater proportion of the African-Americans stopped were stopped for crime related reasons than was the case with Whites. And some of this difference may be due to the number of occupants in vehicles – vehicles with more occupants had longer stop times and African-Americans were more likely than Whites to be in multi-occupant vehicles. However, these factors alone cannot account for all of the difference in times because some difference remains regardless of how we examined the data.

B. What Sanctions Result from Stops?

Table 15 shows the relative frequency for citations, arrests, searches, and no sanctions for each race. African-Americans were the most likely drivers to have no sanction following a stop, but also the most likely to be arrested or searched. The arrests are consistent with the finding reported earlier that African-Americans were more likely to be stopped for crime related reasons than were Whites.

Table 15: SANCTIONS RESULTING FROM STOPS

	White	Black	Other	All
No Search, No Cite & No Arrest	17.2	22.8	15.9	19.8
	(594)	(787)	(27)	(1408)
Citation Only	72.7	46.8	67.1	60.0
	(2538)	(1619)	(114)	(4271)
Arrest Only	0.4	1.2	0.6	0.8
	(14)	(41)	(1)	(56)
Search Only	1.9	3.8	1.8	2.8
	(67)	(131)	(3)	(201)
Cite & Arrest	1.5	5.8	5.3	3.7
	(52)	(200)	(9)	(261)
Cite & Search	1.3	4.5	1.2	2.8
	(45)	(155)	(2)	(202)
Arrest & Search	1.5	4.4	2.4	2.9
	(51)	(152)	(4)	(207)
Cite, Arrest, & Search	3.7	10.8	5.9	7.2
	(130)	(375)	(10)	(515)
Total	100.0	100.0	100.0	100.0
	(3491)	(3460)	(170)	(7121)

Table 16: CHANCES OF BEING SEARCHED GIVEN ARREST AND NON-ARREST

	White	Black	Other	All
Number Arrested	247	768	24	1039
Number Arrested & Searched	181	527	14	722
% of Arrested Searched	**73.3**	**68.6**	**58.3**	**69.5**
Number Not Arrested	3244	2692	146	6082
Number Not Arrested & Searched	112	286	5	403
% of Not Arrested Searched	**3.5**	**10.6**	**3.4**	**6.6**

From the numbers in Table 15 we can determine the chances of a search given an arrest or no arrest. These results are presented in Table 16. About 73 percent of the White occupants arrested were searched. The percent of African-Americans searched under the same circumstances is less than five percent less. When we look at stops without an arrest, the difference between races is larger. Though only 3.5 percent of White occupants not arrested were searched, almost 11 percent of the African-Americans not arrested were searched. In

short, when a vehicle driven by an African-American is stopped, and there is no arrest, there is a three times greater chance of a search than is the case when a vehicle driven by a White is stopped without an arrest.

C. How Are Searches Conducted?

Most searches are conducted following an arrest, though a significant number are consent searches (Table 17). Together, these two bases account for over three quarters of the searches. The higher proportion of searches of African-Americans following arrest is consistent with the higher frequency of arrests for African-Americans.

Table 17: LEGAL BASIS FOR SEARCHES

	White (n=310)	Black (n=854)	Other (n=23)	All (n=1187)
Arrest	51.9 (161)	60.7 (518)	60.9 (14)	58.4 (693)
Consent	36.8 (114)	27.0 (231)	21.7 (5)	29.5 (350)
PC	10.0 (31)	14.2 (121)	13.0 (3)	13.1 (155)
Inventory	4.8 (15)	7.4 (63)	8.7 (2)	6.7 (80)
Plainview	3.5 (11)	5.2 (44)	0.0 (0)	4.6 (55)
Other	2.9 (9)	2.6 (22)	0.0 (0)	2.6 (31)

* Percents do not sum to 100% because a search can have more than one legal basis.

About 90 percent of the searches are of people, property, or a combination of person and property (Table 18). This is true for African-Americans and Whites. Overall, there are no substantial differences in how officers conduct searches.

Table 18: TYPES OF SEARCHES				
	White	Black	Other	All
Person Only	51.5	55.0	73.7	54.4
	(151)	(447)	(14)	(612)
Person & Property	31.1	29.7	5.3	29.6
	(91)	(241)	(1)	(333)
Property Only	9.6	5.2	10.5	6.4
	(28)	(42)	(2)	(72)
Frisk Only	6.1	8.0	10.5	7.6
	(18)	(65)	(2)	(85)
Frisk & Person	0.7	1.4	0.0	1.2
	(2)	(11)	(0)	(13)
Frisk & Property	1.0	0.7	0.0	0.8
	(3)	(6)	(0)	(9)
Total	100.0	100.0	100.0	100.0
	(293)	(812)	(19)	(1124)

1. How Long Do Searches Take?

There are no differences between African-Americans and Whites with regard to search duration. Further, searches in crime and non-crime stops are the same length for drivers of both races. This is shown in Figures 10, 11, and 12. Across the board, median search times are two minutes.

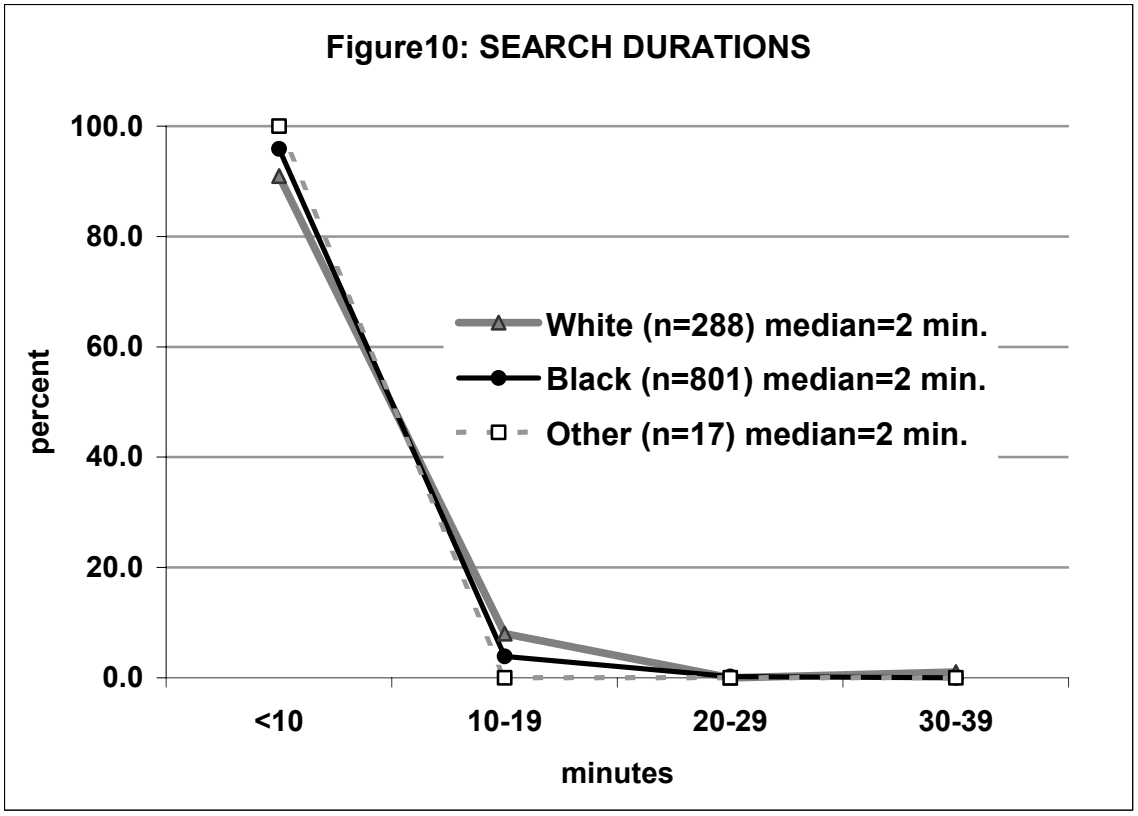


Figure10: SEARCH DURATIONS
100.0
80.0
60.0
40.0
20.0
0.0
percent
White (n=288) median=2 min.
Black (n=801) median=2 min.
Other (n=17) median=2 min.
<10
10-19
20-29
30-39
minutes

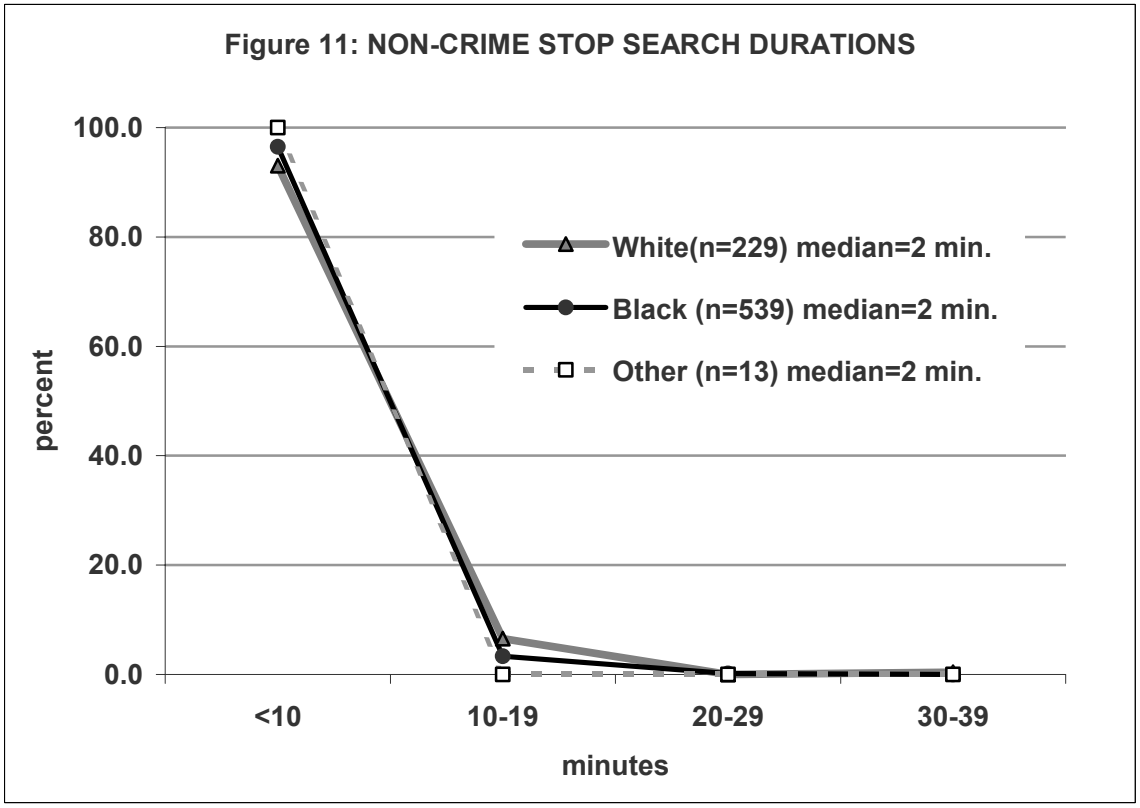
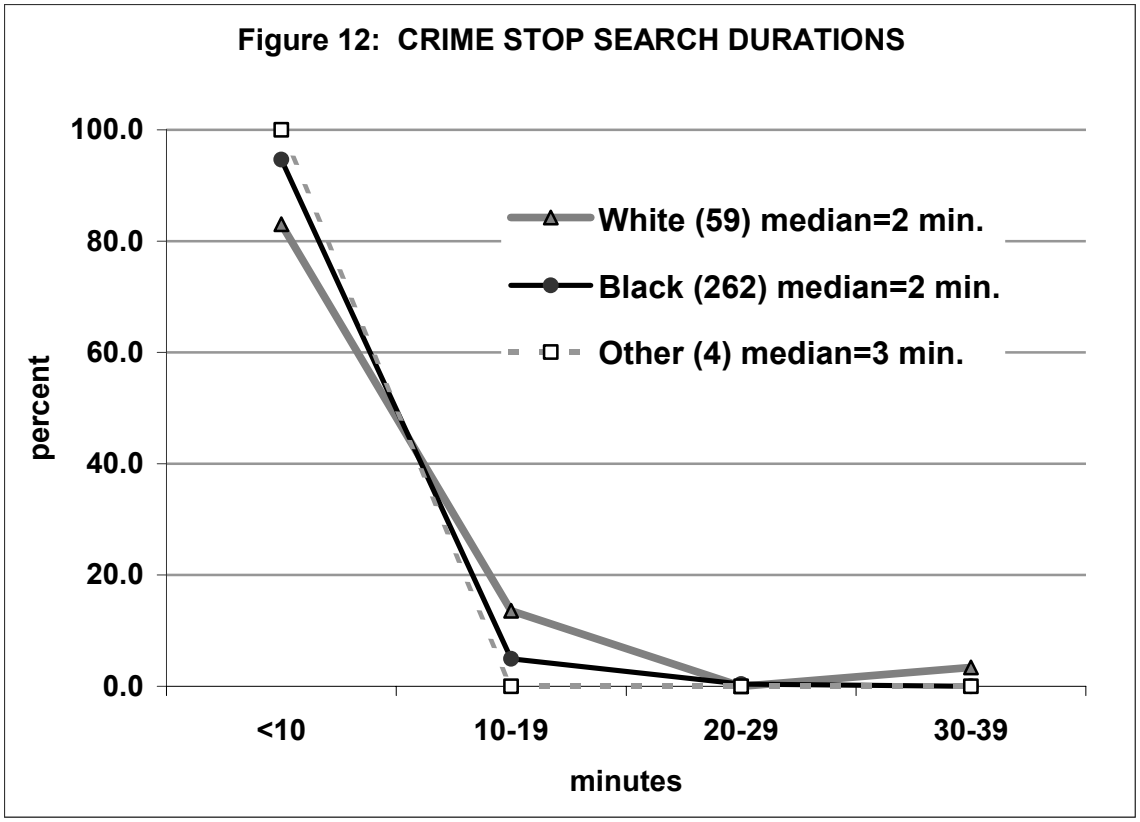


Figure 11: NON-CRIME STOP SEARCH DURATIONS
100.0
80.0
60.0
40.0
20.0
0.0
percent
White(n=229) median=2 min.
Black (n=539) median=2 min.
Other (n=13) median=2 min.
<10
10-19
20-29
30-39
minutes



2. What Were the Results of Searches?

In Figure 13, we see very little difference between the outcomes of searches of African-Americans and Whites, despite the very large difference in the number of African-Americans and Whites searched. Both groups have about a 25 percent chance of a search resulting in some contraband being found. Such a finding is inconsistent with the hypothesis that officer bias is driving their behavior, for if bias was at work, we would expect to see a lower probability of recovering contraband for African-Americans than for Whites.

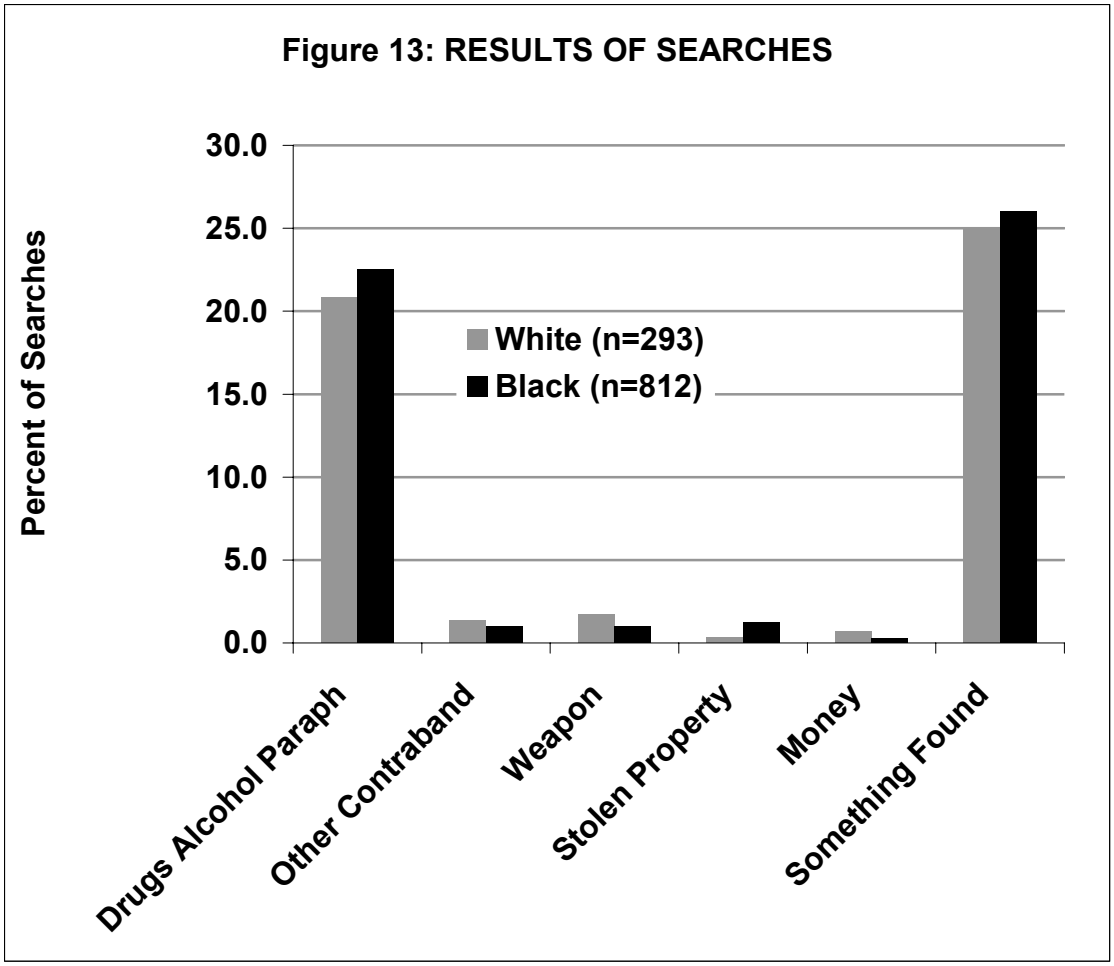


Figure 13: RESULTS OF SEARCHES
Percent of Searches
30.0
25.0
20.0
15.0
10.0
5.0
0.0
White (n=293)
Black (n=812)
Drugs Alcohol Paraph
Other Contraband
Weapon
Stolen Property
Money
Something Found

VI. WHAT DO WE CONCLUDE?

This study found that there are small but important differences in who is stopped among African-Americans and Whites. The group of African-Americans stopped by the police from July 1 through December 31, 2001 tended to contain more males and was somewhat younger than the group of Whites stopped during this time. Additionally, there were more repeat stops of African-American drivers than White drivers. Stops of White drivers were more likely to occur during the day than were stops of African-American drivers. And though most vehicles had a single occupant, regardless of race, vehicles driven by African-Americans were more likely than those driven by Whites to have multiple occupants.

African-Americans and Whites were most often stopped for moving violations. However, more African-American drivers were stopped for crime- related reasons than Whites. From these results, we conclude that African-Americans and Whites may not have been engaged in identical behaviors prior to being stopped. An important question resulting from this part of the analysis is,

- Why are African-American drivers stopped more for equipment violations than Whites?

To determine if African-Americans are over- represented among those stopped, we used the most recent census information and models of driving patterns in the Cincinnati region. Our index of disproportionality varies over Cincinnati neighborhoods. With the existing analytical tools and data available, we are not able to determine how much of the disproportionality found is due to the preexisting conditions noted earlier.

The results of police vehicle stops also vary by race. African-Americans are more likely to be arrested, searched, or receive no sanction than are Whites. Some of this disproportionality may be due to preexisting conditions that one would expect a reasonable officer to address. But there are some differences that cannot be easily explained.

- Why are a greater proportion of the African-Americans who are stopped given no-sanction than is the case with White drivers stopped?
- Why is the probability of an African-American being searched when no arrest has taken place two times greater than that of a comparable White?

Though there appears to be some differences in overall stop duration, these differences diminish when type of stop, time of day and number of occupants are considered. Nevertheless, even when these factors are accounted for, African-Americans have longer average stop duration times than do Whites.

Our analysis of searches failed to find any notable differences between African-Americans and Whites: they had virtually identical search durations; there were no meaningful differences in the types of searches, and the probability of searches turning up contraband was almost identical.

What do these results suggest about the four hypotheses described at the beginning of this report? First, the data available do not allow us to reject any one of these hypotheses. Given what we have found, all must remain viable explanations for at least part of the disproportionality described. Let's look at each hypothesis in light of these results.

Officer Bias: First we must note that these data do not allow us to make hard and fast distinctions between the two different bias hypotheses. Consequently, we will consider them together. This obscures a potentially important distinction because if bias exists it will be important to know its causes if appropriate policies are to be implemented.

There are several results that are consistent with the bias hypotheses. In particular, the higher rate of stops for equipment violations, the higher proportion of stops resulting in no sanction and the greater probability of searches of African-Americans if no arrest is made. Stops without sanctions raise the question about why the stops were made. A similar question is raised by the higher probability of searches.

Arguing against the bias hypotheses are four other findings. First, the spatial pattern of stops appears to be associated with the spatial patterns of driving patterns, crime, drug calls, overall demand for police services, and traffic accidents. The correlations between stopping rates for African-Americans and accident rates and minor crimes are particularly high.

Second, overall stop duration differences are explainable by the number of occupants, so these this too is inconsistent with the bias hypothesis. It takes longer to process more people and on average vehicles with African-Americans had a greater number of occupants.

Third, search durations are the same across races. Fourth, the probability of detecting contraband is the same for searches of African-American and White driven vehicles. One would expect lower detection rates for African-American driven vehicles, if these vehicles were stopped and searched for less valid reasons than White driven vehicles.

These contrasting findings make it difficult to state categorically that bias is a substantial cause of disproportionate stopping of African-Americans. In fact, it seems reasonable to conclude that if bias is involved anywhere in the stopping process, it may be a greater issue after the stop has been made than in the initial decision to make the stop. But even after the stop these data can neither support nor categorically rule out the bias hypothesis.

Preexisting Conditions: As we noted at the beginning of this report, these data are not particularly suited for exploring this hypothesis. One consequence is that

we do not have information that could reject it, even if the hypothesis is invalid. There are some results that are consistent with this hypothesis, however.

First, African-American drivers are a bit younger than White drivers. Within the age range we are concerned with in this study (15 years old and higher) young people are known to be more likely to be involved in deviant behavior than older people. This is true regardless of race and is very well documented in criminological research.

Second, a slightly higher proportion of the African-Americans who are stopped are males than is the case with Whites who are stopped. This corresponds to another known criminological fact: males tend to be more involvement in deviancy than females.

Third, there is greater repeat stopping of individual African-American drivers than of white drivers. This is consistent with the well-documented phenomena of repeat offending.

Fourth, as mentioned in our discussion of the bias hypothesis, the correlations between accidents and minor crimes in the spatial distribution of stops is compatible with the preexisting condition hypothesis.

These findings are consistent with the finding that African-Americans are more likely to be stopped for crime related reasons than Whites. Though these differences are not immense, they are consistent. Collectively they support the hypothesis that some portion of the disproportionality observed is due to disproportionate involvement in crime and disorder. That is, the disproportionate stopping of African-Americans may be due to officers reacting to behaviors they observe rather than officers seeking to stop African-American drivers in preference to White drivers.

We must note that none of these findings in support of the preexisting conditions hypothesis help us understand what occurs after stops.

Police Policy: The last hypothesis is that the disproportionality is larger than it needs to be due to a policy of encouraging police officers to make stops in the belief that aggressive enforcement across the board reduces crime and disorder. To the extent that the police department expects, encourages or simply endorses the use of vehicle stops to control crime and disorder, it could unintentionally increase racial disproportionality in stops. Encouraging unfocused aggressive enforcement would amply any preexisting disproportionality. Further, it would also provide cover for any officer who desires to act on his or her biases.

Such a strategic posture might be justifiable to the community at large if there were substantial evidence supporting the hypothesis that more stops of vehicles reduces crime and disorder. Unfortunately for this hypothesis, there is no such

body of evidence. Highly circumscribed crackdowns – limited in duration and area – can reduce crime, at least temporarily and without substantial displacement. However, systematic reviews of the research on police crime control effectiveness consistently show that there is no reliable scientific evidence that generalized encouragement to stop suspicious vehicles at any time and in any place reduces crime.

Our concern that the strategic posture of the police department may contribute to disproportionate stopping of African-Americans to some degree is based on three pieces of circumstantial evidence.

First, we noted the greater chance of African-Americans being stopped for equipment violations than was the case for Whites. This may be due to racial disparities in income. Nevertheless, the impact of equipment violation stops falls more on African-Americans than Whites. An unequal impact such as this requires a demonstrated public benefit to justify it.

Second, African-American vehicle stops are less likely than White vehicle stops to occur at repeat stop locations. That is they are more spread out. If the Cincinnati Police Department were using vehicle stops to control crime at hotspots, we would expect to see higher, not lower, repeat addresses among African-Americans. The greater geographic spread of African-American stops relative to Whites may reflect the concentration of White motorists on arterial routes. Nevertheless, it does not indicate that stops are being used to control crime hot spots in African-American neighborhoods.

Third, African-Americans are more likely than Whites to have no sanction imposed upon them following a stop. We do not know why this is the case. But it raises a question about why a small but important proportion of the public is stopped for no obvious reason, and why African-Americans are disproportionately represented among these people.

In fairness, there may be perfectly sound reasons for these outcomes that the vast majority of the public would endorse. However, in a democratic society it is incumbent upon the government to demonstrate why it is impinging upon the freedom of members of the public.

To what extent are these results generalizable? We have no confidence that these results are generalizable to time periods prior to July 1, 2001. The very existence of the forms to record data on the race of individuals stopped by the police may have changed police behavior. Further, events in the year leading up to July, 2001 are likely to have had an impact on officers' perception of their work, how they did their job, and on how citizens react to officers.

We are somewhat more confident that these results are generalizable forward in time. But again, we must exercise considerable caution. During the time period

we examined, officers may have been stopping fewer vehicles and may have been particularly reticent about stopping vehicles with African-American drivers. If this was the case, our results might understate current levels of African-American disproportionality. On the other hand, the events of 2001 and the implementation of the collaborative agreement may have altered the way police interact with citizens in ways that reduce African-American disproportionality. Until analyses similar to these have been conducted, we will not be able to answer this question.

A major limitation in these data is the lack of an historical perspective. Tracking how officers make stops over time will provide information on trends in disproportionality and will allow policy makers to examine the impacts of police practices on disproportionality. As importantly, consistent reporting of disproportionality, along with crime data, will help assure the public that both are being addressed. As important as documenting how police conduct stops of citizens, we must emphasize that data from these stops only provides an incomplete picture of how and why disproportionality arises. Other information needs to be sought to develop appropriate policies to limit disproportionality.

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